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A REVISION OF THE GENUS *SYNUCHUS* GYLLENHAL (COLEOPTERA: CARABIDAE) IN THE WIDEST SENSE, WITH NOTES ON *PRISTOSIA* MOTSCHULSKY (*EUCALATHUS* BATES) AND *CALATHUS* BONELLI.

By Carl H. Lindroth.

(*Zoological Institute, University of Lund, Sweden.*)

Manuscript received 2nd November, 1955.

(Read 4th April, 1956.)

With 39 Text-figures.

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1. Introduction.

The study of the male genitalia has contributed greatly to our knowledge of the taxonomy of Carabid beetles. In large and difficult genera such as *Bembidion*, *Trechus*, *Harpalus*, and in several groups of Pterostichini, Agonini, etc., this investigation is essential and no description of a new species should be made unless accompanied by a careful drawing of the male copulatory organ.

The features of the male genitalia specially suitable for comparative studies can be divided roughly into three groups: (1) the outer form and surface sculpture of the penis, (2) the armature of the inverted internal sac of the penis, and (3) the form of the parameres.

The first-named group of characters is fundamentally of specific value. Even closely related species, the separation of which on external factors alone may be extremely difficult (e.g. *Bembidion lampros* Hbst. and *properans* Steph.), often possess amazingly different penis forms. Similar use can be made of the spines, teeth, bristles, etc. of the internal sac which, if present, often

show a surprising complexity and, at the same time, are almost constant within the species. The details of this armature are, moreover, also suitable for a comparative study of the species within the genus, and for fixing homologies, thus enabling species groups (subgenera and corresponding units) to be established, based on what may be regarded as true relationship (e.g. within the genus *Bembidion*). The parameres, however, often show considerable individual variation and are seldom useful for defining a species, but their general structure seems to be very constant and is often excellent as a criterion of a genus or even of higher taxonomic units. An instance thereof is given in this paper.

2. The "Genus" *Pristodactyla* Dejean.

The inception to this study was provided by the so-called genus *Pristodactyla* Dejean, 1828. I found, when investigating the North American species referred to this genus, that in the structure of their parameres they belonged to three quite different types. In order to obtain an idea of the content of this "genus" as a whole I extended the study and eventually succeeded in obtaining reliably identified specimens of all species, most of them of East Asian origin, which, in the literature or in museum collections, have passed under the name of *Pristodactyla*. Their total number is 21. Csiki (Junk and Schenkling, 1931 : 815–816) listed 23 species and added one (*crenata* Putz.) in his supplement (1933 : 1670). Seven of them, however, described by Casey from North America, are pure synonyms. On the other hand, four species not mentioned by Csiki have been referred to *Pristodactyla* in certain catalogues or museum collections, viz. *mexicana* Chd. (Bates, 1873 : 274), *ovipennis* Putz. (Casey, 1913 : 160), *nitida* Mor., and *ambigens* auctt. (nec Bates).

Figure 1 gives an idea of the checkered content of "*Pristodactyla*". Judging from the structure of the parameres, the species belong to four different groups, with no transitional forms. It seems reasonable to conclude that they must be referred to as many different genera. However, as will be shown below, these four genera are already known by older names and the name *Pristodactyla* must be synonymised.

Dejean (1828 : 82–83) established *Pristodactyla* gen. n. on the North American *Calathus impunctatus* Say (1823 : 45–46, *Feronia*) alone.[1] The only important feature mentioned, separating the new genus from *Synuchus* Gyllenhal, 1810 (*Taphria* Dejean, 1828), (type species *nivalis* Panz.), is the non-dilated terminal segment of the labial palps (fig. 14A ; cf. fig. 10A). But, among the East Asian species referred either to *Synuchus* or to *Pristodactyla*, all stages of transition occur between the extreme types represented by these two species (figs. 14A–E). Therefore this character has no generic value and it is even very doubtful whether *Pristodactyla* can be maintained as a subgenus of *Synuchus*.

Leconte originally (1848 : 217–218) accepted Dejean's genus *Pristodactyla* for *impunctata* Say and added his own *advena* ; his *dubia* also in 1854. Later (1854 : 37–38) he expressed doubts as to the separation from *Synuchus* ("*Taphria*") but, finally (1860 : 317–318), united *Pristodactyla* with *Calathus* Bon. This view was still held by Van Dyke (1924 : 11).

[1] In spite of this fact, Semenov (1889*a* : 691) and Jedlička (1953 : 106) reserve the name for the Caucasian species and Jeannel (1937 : 74) speaks of *Pristodactyla* as a "genre asiatique" and describes the right paramere as "styloïde" (both equally wrong).

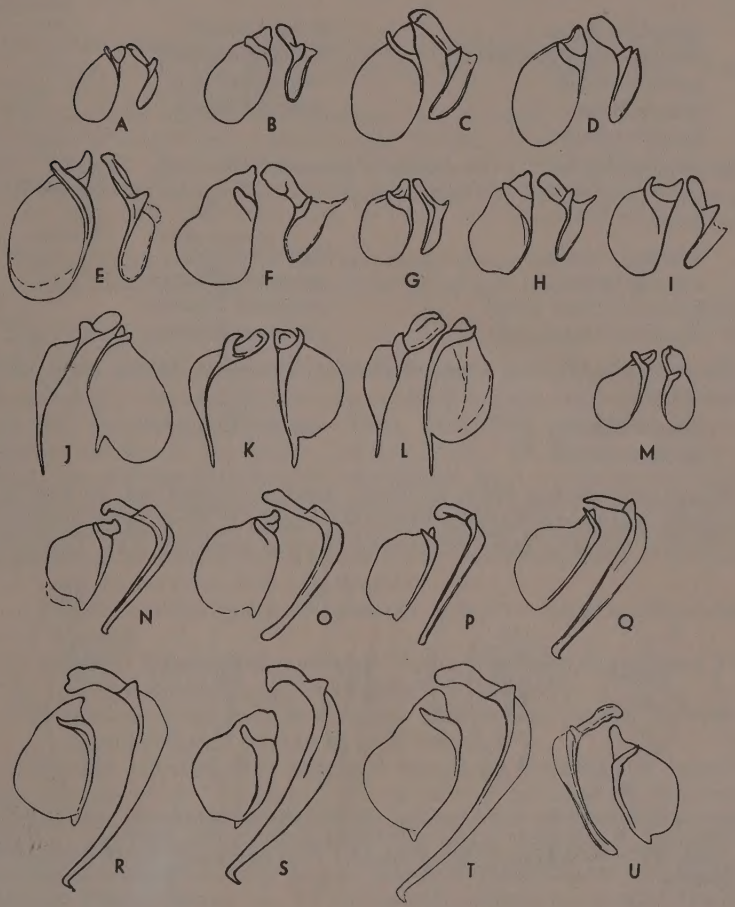

FIG. 1.—Parameres of all species referred to genus *Pristodactyla* Dej. A, *agonoides* Bts. (China, Shensi); B, *arcuaticollis* Mtsch. (Japan, Kyoto); C, *cathaica* Bts. (China, Foochow); D, *crocata* Bts., holotype (Japan, Hakodate); E, *cyclodera* Bts. (Korea); F, *dubia* Lec. (U.S.A., New Mexico); G, *dulcigrada* Bts. (Japan, Kyoto); H, *impunctata* Say (Newfoundland); I, *semirufa* Csy. (Mexico, Durango); J, *crenata* Putz. (Punjab, Kulu); K, *lacerans* Bts. (Kashmir, Pahlgam); L, *nitidula* Mor. (Siberia, Amur); M, "*ambigens* auctt.", *nec* Bts. (U.S.A., Arizona); N, *advena* Lec. (U.S.A., California); O, *alticola* Bts., paratype (China, Szetschuan); P, *ambigens* Bts., paratype (Mexico); Q, *mexicana* Chd. (Mexico, Morelos); R, *caucasica* Chd. (Caucasus); S, *horsti* Reitt. (Caucasus); T, *praestans* Heyd. (Caucasus); U, *ovipennis* Putz. (Mexico, Oaxaca). (Slightly varying magnification.)*

* As the drawings for this paper were made at many different museums and with different kinds of optical equipment, no complete uniformity in magnification could be achieved.

The following species of "*Pristodactyla*" should be referred to *Synuchus* s.l.:

agonoides Bates.
arcuaticollis Motschulsky.
cathaica Bates.
crocata Bates.
cyclodera Bates.
dubia Leconte.
dulcigrada Bates.
impunctata Say.
semirufa Casey.

Another group of "*Pristodactyla*" possesses the long, "styloïd" right paramere, characteristic of *Calathus* Bon., and belongs to that genus in the widest sense:

advena Leconte.
alticola Bates.
ambigens Bates (*vera*).
caucasica Chaudoir.
horsti Reitter.
mexicana Chaudoir.
ovipennis Putzeys.
praestans Heyden.

Three species are true *Pristosia* Mtsch. (*Eucalathus* Bates), with reduced left paramere:

crenata Putzeys.
lacerans Bates.
nitidula Morawitz.

Finally, the species which in North American collections, as well as in Leng (1920 : 62) and Blackwelder (1944 : 41), passes as "*Pristodactyla ambigens*" (nec *Calathus ambigens* Bates, 1891 : 251)[2] is a true Agoni (fig. 2A). I am unable

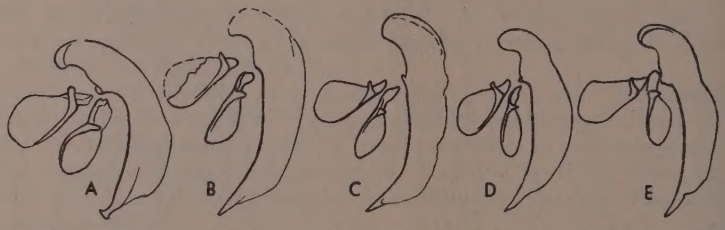

FIG. 2.—Aedeagus of some true Agoni. A, "*Pristodactyla ambigens* auctt.", *nec* Bts. (U.S.A., Arizona); B, *Dicranoncus* (*Monacanthonyx*) *pocillator* Bts. (Burma); C, *D. ravus* Andr., paratype (Ceylon); D, *D. amabilis* Chd. (Sarawak); E, *D. femoralis* Chd. (Burma).

to decide whether it has ever been described or whether it can be referred to *Agonum* s.l. Externally it is very like "*Dicranoncus*" *ravus* Andrewes (1936 : 205) from Ceylon but, according to a male paratype (BMNH), this species lacks the tooth at the base of the tarsal claws and, therefore, probably does not belong to *Dicranoncus* Chaud.

3. The Groups of the Tribe Agonini.

If the Agonini (Platynini) are regarded as a tribe of the subfamily Pterostichinae, separate from the true Pterostichini, and the parameres of the male

[2] This misinterpretation of *Calathus ambigens* Bts. was apparently first made by Schaeffer (1910 : 394), who reported it from Arizona and gave a short description which does not agree with the true *ambigens* Bts.

genitalia are used as a principal character, they may be divided into the following subtribes :

1 One of the parameres (almost constantly the right one) narrow, styloïd, arcuate, much longer than the other (fig. 33) . . . **Sphodri** (incl. *Calathi*)
– None of the parameres styloïd 2
2 Left paramere reduced, much narrower than the right, at least one of them prolonged into a membranous filament (figs. 29–31). Penis " inverse", lying in repose on its left side . . . **Pristosiae** (*Eucalathi*)
– Left paramere large, at least broader and longer than the right, rounded at apex, but sometimes with a short and broad membranous appendix. Penis normal 3
3 Right paramere reduced, its basal part constituting a narrow " handle " which forms an angle with the broad apical part (figs. 4, 9, 13, etc.). **Synuchi**
– Right paramere shaped similarly to the left one, though smaller (fig. 2) **Agoni**

The great confusion between the groups treated in the above key is clearly demonstrated if the arrangement here proposed is compared with that used in Junk and Schenkling's *Catalogus* (Csiki, 1929 : 739). It is also shown in Andrewes' revision of the Indian *Calathus* (1934). To this genus he refers 34 species, but with the introductory remark that he is unable to draw a clear distinction between *Calathus* and *Pristodactyla*. I have seen authentic specimens of all these species (almost all in the British Museum (Nat. Hist.)) and studied the genitalia where males were available. They must be referred as follows :

1 species (*adelosia* Andr.) to *Synuchus* s. str.
2 species (*pallipes* Andr., *sikkimensis* Andr.) to *Synuchus* (*Pristodactyla* group).
6 species (*algens* Andr., *gelascens* Andr., *himalayae* Bts., *kollari* Putz., *melanocephalus* L., *suffuscus* Andr.) to *Calathus*.
25 species (= the rest) to *Pristosia* (*Eucalathus*), though the number should probably be reduced to 22 (see, p. 548).

It must be regretted that Andrewes, though he dissected and figured the penis of several of his " *Calathus* ", did not take any notice of the parameres.

Quite recently, Jedlička (1953) who, in the course of several years (1931–1940), described many new species of East Asian Agonini in scattered and sometimes not easily available papers, published a rearrangement of the whole subfamily Pterostichinae. As he consistently refuses to consider the male genitalia, his review has merely added to the general confusion. It is not necessary to summarize the criticisms of his taxonomy in the present paper but, as far as the groups here treated are concerned, the reader is referred to the discussion of the actual cases below.

4. The Synuchi.

The essential character of this subtribe is the peculiar, " fiddle-like " form of the reduced right paramere. Its narrow basal part forms a " handle ", situated at an obtuse angle to the broader apex. This feature is so striking that it may be permissible to regard it as an indication of true relationship between the three genera treated below (*vide*, however, *Platyderus*, p. 564), in spite of the fact that no common external character seems to be available for separating them consistently from all genera of related groups of the Agonini.

According to Jeannel (1937 : 74) the monotypic genus *Monacanthonyx* from Burma (now usually withdrawn under *Dicranoncus*; Andrewes 1931 : 528; 1946 : 81–82) has the right paramere reduced, as in *Synuchus*. I have seen the male of *Dicranoncus pocillator* Bts., with dissected genitalia (fig. 2B), on which Jeannel based his opinion (MNP), and Dr. Per Brinck of this institute kindly compared it with the typical specimen in the Genoa Museum. As shown in the drawing, one of the parameres of the Jeannel specimen is mutilated but this is the left one and the parameres of the species no doubt belong to the ordinary type of the true Agoni.

Key to Genera of the Subtribe Synuchi.

1 Frontal margin of prothorax slightly produced in the middle (fig. 3).[3] Claws simple. Mentum tooth simple. Prosternum margined at tip. (Elytra with dorsal punctures on the third interval.) "Handle" of right paramere longer and less angular to the enlarged apical part (fig. 3) . . . . . **Platyderus** Stephens

– Prothorax with straight front margin. Claws serrate or denticulate (except in the *nikkoensis*-group of *Synuchus*, in which the dorsal punctures of elytra are lacking). Mentum tooth divided or at least emarginate at apex. Prosternum immarginate 2

2 Mesothorax with prolonged basal part; the scutellum, placed on this "stalk", lies between the elytra at its apex only (fig. 4A). Elytra without microsculpture. Terminal segment of labial palps strongly,

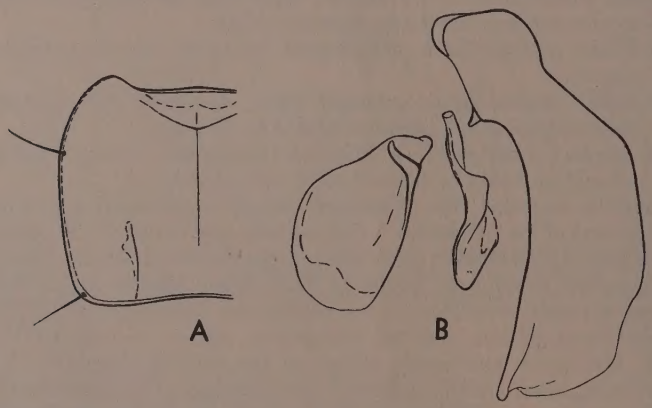

Fig. 3.—Prothorax and aedeagus* of *Platyderus rufus* Dft. (Austria, Graz).

* Jeannel's figure of *Platyderus ruficollis* Mrsh. (1942 : 840) shows a specimen in which the basal part of the right paramere has been lost.

[3] It is remarkable that in *Platyderus* the hind part of the vertex of the head, *i.e.* the part normally concealed under the centrum of the front margin of the prothorax, with its projection, has a microsculpture quite different from the normal, weak, isodiametric one on the rest of the head. It is extraordinarily strong, consisting of transverse meshes which are so convex that they form veritable granulae. In *Synuchus* the microsculpture is uniformly developed over the entire head. Also, on the under surface of the anterior dorsal margin of the prothorax, the microsculpture is better developed in *Platyderus*, compared with *Synuchus*. Possibly it is a question of a stridulatory organ in *Platyderus*.

in the male immensely, enlarged (fig. 4C). Front tarsi with four slightly enlarged segments in the male. (One Japanese species) **Parabroscus** gen. n.

– Mesothorax normal; scutellum dividing the elytra at base (*e.g.* fig. 8). Elytra with microsculpture consisting of meshes or transverse lines. Labial palps less enlarged (maximum, *vide* figs. 5, 10). Front tarsi with three strongly enlarged segments in the male . **Synuchus** Gyllenhal

I am not proposing to revise, in this work, the large and difficult genus *Platyderus*. It is represented in W. Europe, the Mediterranean region, and east as far as West Turkestan.

(*a*) **Parabroscus** gen. n.

The single species, from Japan, differs in so many ways from *Synuchus* s.l. that it seems necessary to regard it as generically distinct. The peculiar *Broscus*-like habitus is due to the form of the prothorax and especially to the prolonged, stalk-like base of the mesothorax, bearing the scutellum, which divides the elytra at the base of the suture by its outermost tip only (fig. 4A).

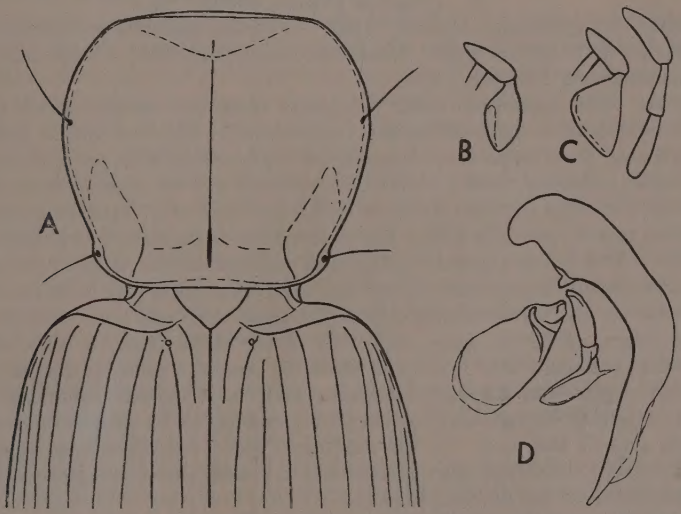

FIG. 4.—*Parabroscus crassipalpis* Bts. A, prothorax and part of elytra; B, labial palp of ♀; C, palps of ♂; D, aedeagus. (B from the ♀ holotype, the rest from ♂, Japan, Kamikôchi.)

Head large with notably broad neck. Prothorax pronouncedly convex, its lateral margins thick, without reflexion inside, the hind-angles evident though obtuse and more or less rounded, the base strongly arcuate laterally, with complete raised bead. Elytra likewise very convex, broadest behind middle, basal margin almost straight, shoulders completely rounded, the side margin not sinuate before apex; the striae deep, smooth, the intervals strongly convex throughout, the third with two dorsal punctures. Entire upper surface strongly shining, without microsculpture of any kind. Terminal segment of labial palps (fig. 4C) enormously dilated in the male, less so in the female. Tarsi with no longitudinal furrows; in the male the pro-tarsi with four slightly dilated segments.

Parabroscus crassipalpis H. W. Bates

Taphria crassipalpis Bates, 1873 : 274–275.
Synuchus sakataensis Habu, 1954 : 237.

Bates' single female type, from Hyogo, is in the BMNH. I have not seen the type of *sakataensis* Habu, but Mr. Uéno sent a female from Nasu, which he had compared with it. In addition, Habu (*loc. cit.*) published a good habitus drawing of his specimen.

Deep, shining black; mouth-parts, antennae, femora at tip, tibiae and tarsi brown. Hind-wings fully developed and strong. Aedeagus, fig. 4D. *Length :* 10·8–12·0 mm.

Distribution.—Japan : Shikoku, pref. Tokushima, Mt. Tsurugi, 4.viii.53, ♂ (*M. Uozumi*, coll. Uéno). Honshu, pref. Hyogo, ♀ (*loc. class.*) ; pref. Nagano, Kamikôchi, 28–30.vii.39, ♂♀ (Suen.) ; pref. Tochigi, Nasu, 20.vii.49, ♀ (*T. Azegami*, coll. Uéno) ; pref. Yamagata, Sakata, 12.viii.52 2, ♀ (*Habu*, l.c.).

(*b*) Synuchus Gyllenhall, 1810.

(*Taphria* Dejean, 1828)

(including *Pristodactyla* Dejean, 1828 ; *Crepidactyla* Motschulsky, 1861 ; *Trephionus* H. W. Bates, 1883 ; *Parcalathus* Jedlička, 1940 ; *Fürthius* Jedlička, 1953 ; *Semenovia* Jedlička, 1953).

In the wide sense here used, the genus comprises species which deviate considerably from the general habitus represented by the type species, *Synuchus nivalis* Panz. In this species the prothorax is almost circular, without traces of hind-angles, whereas these are clearly developed or even prominent in several other species. The mentum tooth is always divided or at least emarginate at the apex, usually strongly bifid. The prosternum is constantly immarginate at the apex. The elytra possess a setigerous puncture at the base of the second stria and (except in *formosanus* and the *nikkoensis* group) at least two dorsal punctures on the third interstice (the preapical puncture not counted). The terminal segment of the palpi, especially of the labial palpi, is often dilated. The meso- and meta-tarsi (except in *atricolor*) possess a more or less developed external longitudinal furrow, sometimes sharp and laterally delimited by a ridge ; a similar though less pronounced groove may be present also on the internal side of the tarsi. In the *nikkoensis*-group the claws are completely smooth inside ; in all the other species they are serrate or denticulate although, in some, the teeth are much reduced.

The most useful external characters for separating species and groups of species in *Synuchus* are : (1) the form of the terminal segment of the palps ; (2) the form, the basal foveae, and the lateral depression of the prothorax ; (3) the shoulder angle (i.e. the angle formed by the raised basal and lateral margins of elytra) ; and (4) the microsculpture of the elytra. The longitudinal furrows of the meso- and meta-tarsi, used as a major character by Semenov (1889*a*) and others, are liable to considerable individual variation (*vide* Leconte, 1860 : 317). The form of the mentum tooth is likewise more variable than generally accepted. Neither is the development of the denticles on the inside of the claws, present in most species, a completely reliable character ; the denticles become worn during the lifetime of the adult insect (fig. 17B).

The external sexual differences are most easily observed on the front tarsi,

which in the male have three dilated basal segments, covered with suckers below. In the *nitida*-group (" *Crepidactyla* ") there are also sexual differences in the palps. The microsculpture of the elytra is usually stronger in the female, which then has a duller appearance, but essential sexual differences seem not to exist in this respect (except in *callitheres*, p. 534).

In the male the parameres show considerable individual variation in the details of their outlines, but the form of the penis is very constant within the species, of which it usually constitutes the most reliable criterion. The internal sac seems to lack structures of taxonomic value.

I am well aware that many students would have preferred to divide the complex here treated as one genus, *Synuchus* s.l., into several genera. In fact it includes the earlier genera *Crepidactyla* and *Trephionus* (not to mention Jedlička's *Parcalathus*, *Fürthius* and *Semenovia*), and the main part of *Pristodactyla*, as well as some species from *Calathus*, *Eucalathus* and *Paradolichus*. The *atricolor*-group, as well as *callitheres* Bts., especially are isolated and would perhaps merit the erection of two new genera. On the other hand, the *nikkoensis*-group (*Trephionus*), seemingly aberrant, is linked with the more normal species through *longipes* and *patroboides*.

On principle I prefer to use the generic concept in the widest possible sense, so that the generic name serves its original and real purpose (besides giving an idea of true relationship) of giving even the non-specialist an idea of the taxonomic position of a certain animal species. In large insect families, difficult to survey, as that of Carabid beetles, it is the rule that some very large and complex genera (*Carabus*, *Bembidion*, *Pterostichus*, *Amara*, *Agonum*, *Harpalus*, &c.) are still conserved as skeletons around which are grouped smaller genera, the members of which are considered too aberrant to be pressed in under the limits of the most-related, large main genus. One often gains the impression, however, that these small genera are not sufficiently separated *inter se*, i.e. that the demands of what constitutes a genus become smaller the smaller the genera are, even within families (e.g. the Carabidae) where the other large genera are conceived in a very wide sense by most modern students.

The genus *Synuchus* must of course be divided into species groups, some of which are well defined. But the idea of using subgeneric names (in part the earlier genus-names : *Crepidactyla*, *Trephionus*, &c.) was abandoned in favour of groups named after their typical species only.

The descriptions below, even of the new species, are short. Many of the species are extremely similar and I have concentrated on the few distinguishing characters (if possible, illustrated by drawings) rather than giving an enumeration of all visible, mainly unimportant details.

A biological feature, possibly common to all species of *Synuchus* (but *vide dulcigradus*, p. 515), is the late appearance of the imagines in summer. In *nivalis* (Lindroth, 1945 : 645) and *impunctatus* (Lindroth, 1955*a* : 115) it has been stated that hibernation takes place exclusively in the larval stage (see also figs. 38–39, p. 569) and, according to the observed immature specimens of many other species, the beetles do not appear, in a temperate climate, until June or the beginning of July (in southern regions often earlier). As for other Carabid beetles May and June are the best collecting season, the unfortunate result is that the Synuchi are represented in the collections by a large proportion of immature specimens, the identification of which presents considerable

difficulties. Above all, the incompletely chitinised penis becomes flattened and otherwise deformed (cf. figs. 16H, 25F) during the drying of the dead insect.

The ecology is sufficiently known only for *nivalis* in Europe and *impunctatus* in North America. They are very similar in choice of habitat: open or slightly shaded, rather dry ground, containing a large proportion of gravel or sand (often on moraine) and sparse vegetation.

KEY TO THE SPECIES OF *SYNUCHUS* (BASED ON EXTERNAL CHARACTERS ONLY).

1 Claws completely smooth inside (fig. 19A). Elytra without dorsal punctures. (Prothorax with basal setigerous puncture close to the hind-angles.) Japanese species 2
– Claws serrate inside (figs. 11C, 17A) or at least with rudiments of teeth (figs. 11D, 19B, C). Elytra with (usually two) setigerous punctures on third interstice, the preapical puncture not counted. (The only exception is the *formosanus*-group, in which the basal setigerous puncture of prothorax is lacking) 8
2 Microsculpture of elytra consisting of isodiametric meshes 3
– Microsculpture of elytra consisting of transverse lines or clearly transverse meshes[4] 5
3 Eyes much reduced, their diameter not longer than the distance between their front margin and the point of insertion of the antennae. All tarsi with slightly concave dorsum. Prothorax (fig. 20E) almost square . . . . . 42. **microphthalmus** Uéno
– Eyes slightly reduced, their diameter much longer than the distance to the antennae. Tarsi with convex dorsum. Prothorax, figs. 20A, B 4
4 Dark brown. Length more than 9 mm. . . . . 39. **obscurus** Uéno
– Unpigmented, reddish-brown. Length about 8 mm. . 38. **takakurai** Habu
5 Antennae pubescent from apical half of third segment . . 43. **igai** Uéno
– Antennae pubescent from fourth segment, as usual 6
6 Basal setigerous puncture of prothorax widely removed from the hind-angles, which are completely rounded, the sides straight in front (fig. 20C) . . . . . 40. **sordidatus** Habu
– Basal setigerous puncture in normal position, hind-angles more or less angulated, sides in front more or less sinuate 7
7 Unpigmented, reddish-brown. Eyes flat, much reduced, their diameter hardly greater than the distance between their front margin and the point of insertion of the antennae . . . 41. **kurosai** Uéno
– Blackish or dark brown. Eyes normal, convex, their diameter much greater than the distance to the antennae . . . 37. **nikkoensis** Bates
8 Posterior setigerous puncture of prothorax lacking (fig. 6D). Formosa 9
– Prothorax with the usual setigerous puncture close to the hind-angles 11
9 Third interstice of elytra without dorsal punctures, their microsculpture consisting of isodiametric meshes . . . . . 5. **formosanus** sp. n.
— Third interstice with two dorsal punctures. Elytral microsculpture consisting of transverse lines, fusing into transverse meshes . . 10
10 Hind-tarsi with a longitudinal groove on each side. Microsculpture meshes of elytra only slightly transverse . . . 6. **testaceus** Jedlička

[4] The microsculpture of the elytra, a very important character, should be studied on the central part of the inner interstices. A magnification of about × 100 and good light are necessary.

— Hind tarsi smooth inside. Microsculpture meshes of elytra strongly transverse . . . . . 7. **rufofuscus** Jedlička

11 Terminal segment of labial palps strongly dilated (figs. 5, 10) . . . 12

— Terminal segment of labial palps fusiform or almost cylindrical, sometimes slightly enlarged towards apex (fig. 14) 24

12 Hind-tarsi with basal segments longitudinally furrowed on each side (though less evidently so on the inside). Palps sexually different (figs. 5A–I). 9·9–16 mm. East Asia 13

— Hind-tarsi smooth inside (or with faintest suggestion of a longitudinal groove). No sexual difference in the palps. 6–10·2 mm. (only 12. *major*, from China, is larger) 16

13 Terminal segment of labial palps broadly axe-shaped, especially in the male (fig. 5A, C). Microsculpture on base of prothorax consisting of very dense transverse lines . . . . . 1. **nitidus** Motschulsky

— Terminal segment of labial palps less enlarged (figs. 5E–I). Microsculpture more or less isodiametric on base of prothorax . . . 14

14 Prothorax narrow (fig. 6C), basal setigerous puncture almost touching side-margin. Shoulders more produced (fig. 8B) . . 4. **melantho** Bates

— Prothorax almost circular (figs. 6B, 7), basal puncture removed from side-margin. Shoulders rounded 15

15 Prothorax (fig. 7) broader, with prominent front-angles, strongly reflexed sides and deep, prolonged basal foveae. Sides of elytra with slight preapical sinuation. Terminal segment of all palps more dilated (fig. 5E) . . . . . 2. **gravidus** sp. n.

— Prothorax (fig. 6B) with shallow, ill-defined basal foveae. Elytra not sinuate at apex. Palps, figs. 5F, G . . . . . 3. **cycloderus** Bates

16 Microsculpture of elytra consisting of isodiametric meshes without a tendency to form transverse rows. Terminal segment of labial palps very broad (figs. 10A, B, D, F) 17

Microsculpture of elytra consisting of transverse lines, usually fusing to transverse meshes; if wider (almost isodiametric), they are clearly arranged in transverse rows. Labial palps, figs. 10C, E, G, J. East Asia 20

17 Side border of elytra not sinuate at apex. Basal foveae of prothorax small, clearly defined laterally and not prolonged forwards . 18

— Side border of elytra with a shallow but distinct sinuation at apex. Prothoracic foveae indistinctly defined laterally, prolonged forwards on the disc as arcuate, diverging depressions (figs. 12A, C) . . . 19

18 Claws with 4–5 strong teeth (fig. 11C). Shoulder angle of elytra rounded. Widely distributed, Palaearctic species . . 8. **nivalis** Panzer

Claws with only rudiments of teeth (fig. 11D). Shoulders more angulated. W. Turkestan . . . . . 9. **simplex** Semenov

19 Shoulders produced, slightly angulated (as in fig. 11B). Prothorax (fig. 12A) broadest at about middle, with completely rounded hind-angles. China . . . . . 11. **chinensis** sp. n.

Shoulders rounded, less prominent. Prothorax (fig. 12C) broadest before middle, hind angles suggested, though broadly rounded. India . . . . . 13. **adelosia** Andrewes

20 Largest species of the group (13 mm.). Basal foveae of prothorax prolonged forwards almost to middle (fig. 12B). . China. 12. **major** sp. n.

Less than 10 mm. Basal foveae not prolonged 21

21 Microsculpture meshes of elytra very short, in part almost isodiametric. Convexity of prothoracic disc reaching lateral margin, even in basal half. Japan. . . . . 10. **uenoi** sp. n.

— Microsculpture meshes of elytra stongly transverse. Prothorax depressed along lateral margin, at least in the basal half . . . 22

22 Elytra with side-border slightly but distinctly sinuate at apex. Terminal segment of labial palps broader (figs. 10H, I) 15. **congruus** Morawitz

— Elytra without apical sinuation. Labial palps, figs. 10G, J. Elytral microsculpture denser 23

23 Prothorax (fig. 12D) shining, also shining at base, its sides broadly depressed also in the frontal half; a pronounced convexity between basal foveae and side margin . . . . . 14. **brevis** sp. n.

— Prothorax (fig. 12E) dull at base due to strong microreticulation; the lateral depression diffuse, especially in the frontal half; no convexity laterad of basal foveae . . . . . 16. **nordmanni** Morawitz

24 Prothorax (figs. 25A–C) at least as long as wide, with completely rounded hind-angles. Large species (10·7–14 mm.), *Agonum*-like, with long and slender legs. Japan 25

— Prothorax shorter or with defined hind-angles 27

25 Prothoracic base immarginate (fig. 25A). Elytra slightly sinuate laterally at apex, not iridescent . . . . . 54. **atricolor** Bates

— Prothorax with raised basal margin laterally (figs. 25B, C). Elytra not sinuate at apex, more or less iridescent 26

26 Metatarsi furrowed both sides. Shoulder-angle strongly obtuse but distinct . . . . . 55. **picicolor** sp. n.

— Metatarsi smooth inside, faintly furrowed laterally. Shoulders completely rounded . . . . . 56. **iricolor** sp. n.

27 Hind-angles of prothorax well defined, more or less protruding (least in 34. *laticollis*, fig. 15P), and/or the sides sinuate in front . . . 28

— Hind-angles of prothorax rounded, usually completely obsolete, the sides rounded or straight in the basal half 40

28 Hind-tarsi equally and strongly furrowed on both sides, in the female even the pro-tarsi. Large species (9·8–14 mm.) with narrow prothorax (figs. 24A, B). Japan . . . . . 53. **callitheres** Bates

— Internal furrow of hind tarsi shallower than the external one; front tarsi smooth. Prothorax broader 29

29 Length 9–13 mm. Head large with prominent eyes. Prothorax large (figs. 23C, D). Hind wings fully developed. China and Japan . 30

— Length 6·2–9·3 mm. Head narrower, with small eyes. Prothorax narrower (figs. 15N–P, 21D–I). Hind wings completely reduced (except in 32, *pallipes*) 32

30 Microsculpture meshes of elytra, though partly isodiametric, clearly arranged in transverse rows and largely fused into wide, transverse meshes. Inner intervals clearly convex. China . . 50. **cathaicus** Bates

— Microsculpture of elytra consisting of strong, isodiametric meshes throughout, showing no tendency to form transverse rows. The intervals quite or almost flat 31

31 Hind-tarsi furrowed on both sides. Base of prothorax only slightly arcuate laterally (fig. 23D). Elytra diverging at apex (fig. 23B). Japan . . . . . 51. **tokararum** sp. n.

— Hind-tarsi smooth inside. Prothoracic base oblique inside the hind-angles. Elytra not diverging at apex. China 52. **pseudomorphus** Semenov

32 Microsculpture of elytra consisting of slightly transverse or almost isodiametric meshes. The raised lateral margin of prothorax ill-defined basally. India. Formosa 33

— Microsculpture meshes of elytra at least twice as wide as long. Lateral margin of prothorax sharply delimited inwards. Japan. Formosa 35

33 Shoulders strongly produced, almost forming a rectangle. Prothorax (fig. 15P) with sides not sinuate before the hind-angles. Formosa 35. **laticollis** sp. n.

— Shoulders clearly obtuse, more or less rounded. Prothorax (figs. 15N–O, 21D–I), with rare individual exceptions, sinuate before hind-angles 34

34 Basal foveae of prothorax with a tubercle at the middle. Basal margin of elytra strongly arcuate. Hind wings completely reduced. 6·2 mm. (smallest species of the genus). Formosa . . 34. **minimus** sp. n.

— Basal foveae flat. Basal margin of elytra slightly arcuate. Hind wings full, 7·6–9 mm. India . . . . . 33. **pallipes** Andrewes

35 Prothorax (fig. 21I) almost square, with rectangular hind-angles and straight base. Formosa . . . . . 49. **rectangulus** sp. n.

— Prothorax (figs. 21D–H) constricted basally, with obtuse hind-angles and arcuate base. Japan 36

36 Claws with rudimentary teeth (figs. 19B–C) 37

— Claws with well developed teeth (fig. 19D) 38

37 Prothorax (fig. 21D) pronouncedly heart-shaped, sides strongly sinuate towards base. Apex of elytra (fig. 18B) acuminate 44. **longipes** sp. n.

— Prothorax (fig. 21E) less constricted behind. Elytra broadly rounded at apex (fig. 18C) . . . . . 45. **patroboides** sp. n.

38 Third and fourth antennal segments darker than the rest. Hind angles of prothorax poorly developed (fig. 21G) . 47. **picticornis** sp. n.

— Antennae unicolorous, pale. Prothorax, figs. 21F, H 39

39 Prothorax (fig. 21F) with greatest width before middle. Basal margin of elytra slightly arcuate, shoulders rounded. Outer segments of antennae less than twice as long as wide . . . 46. **ventricosus** sp. n.

— Prothorax widest about middle (fig. 21H). Basal margin of elytra strongly arcuate, shoulders angulate. Antennae notably slender, outer segments more than twice as long as wide . 48. **darlingtoni** sp. n.

40 Microsculpture of elytra (at least on the middle of the inner interstices) consisting of more or less regularly isodiametric meshes which show no (or very slight) tendency to arrangement in transverse rows. (Elytra therefore never iridescent) 41

— Microsculpture of elytra consisting of transverse lines, fusing into more or less transverse meshes ; these sometimes only slightly wider than long but always arranged in more or less regular transverse rows. (Elytra often more or less iridescent) 50

41 Terminal segment of labial palps slightly enlarged (figs. 14A, B). Asiatic species 42

— Terminal segment of labial palps fusiform or almost cylindrical (figs. 14C–G) 43

42 Prothorax (fig. 15C) broadly deplanate inside the hind-angles, basal foveae not clearly defined laterally. Prothoracic disc with evident, slightly transverse microsculpture meshes. Japan. 19. **crocatus** Bates

— Basal foveae of prothorax deep, separated from the side-margin (including the hind-angles) by a pronounced convexity (fig. 15A). Microsculpture of prothoracic disc very obsolete. East Asian mainland 17. **intermedius** sp. n.

43 Very shiny, microsculpture effaced on disc of prothorax. Basal foveae deep, separated from the side-margin by a strong convexity which reaches the base. China . . . . . 18. **agonoides** Bates

— Microsculpture evident on disc of prothorax. Basal foveae without strict lateral definition (at least basally), the region inside the basal seta more or less deplanate 44

44 Basal segments of hind-tarsi furrowed on both sides, though the inside furrow may be shallow. Asiatic species 45

— Hind-tarsi furrowed externally only (or with faintest suggestion of an internal furrow). American species 48

45 Lateral raised margin of prothorax ill-defined inwardly, especially in region of basal seta (fig. 15Q). Elytra with a very shallow sinuation of the side-margin just before apex. China . . . 36. **suensoni** sp. n.

– Lateral margin of prothorax sharply defined internally by an impressed line which is unbroken inside the basal seta. Elytra without subapical sinuation 46

46 Shoulders little produced, rounded. Microsculpture meshes of elytra irregularly isodiametric, in part very slightly transverse. Japan 20. **dulcigradus** Bates

— Shoulders strongly produced, angulate. Microsculpture meshes of elytra absolutely and regularly isodiametric. China 47

47 Prothorax and elytra equally semiopaque, owing to strong microsculpture over the entire surface . . . . . 26. **calathinus** sp. n.

— Microsculpture along sides of prothorax and on apex of elytra stronger than elsewhere, the isodiametric meshes being transformed to granulae ; these parts therefore quite dull . . . . . 25. **limbalis** sp. n.

48 Prothorax without defined basal margin inside the setigerous puncture (fig. 15K). Microsculpture meshes of elytra irregularly isodiametric with some tendency to arrangement in transverse rows 30. **impunctatus** Say

— Prothorax (figs. 15L, M) with well-defined raised basal margin laterally. Microsculpture of elytra consisting of absolutely isodiametric meshes 49

49 Tarsal claws with well developed teeth (as in fig. 17A). Length 8·7–9·8 mm. Mexico . . . . . 31. **semirufus** Casey

— Tarsal claws with rudimentary teeth (fig. 17C). Length 10·5–13·2 mm. U.S.A. . . . . 32. **dubius** Leconte

50 Antennae more or less darkened from (and including) the third, fourth or fifth segment 51

— Antennae quite pale 53

51 Third and fourth segments darker than the rest. Japan 47. **picticornis** sp. n.

— Fourth segment not darker than the fifth, third segment usually pale 52

52 Antennae slightly fuscous at least from (and including) the fourth (or third) segment. Femora more or less darkened. Japan 29. **tristis** sp. n.

— Antennae darkened from (and including) the fifth segment. Legs entirely pale. India . . . . . 24. **sikkimensis** Andrewes

53 Hind angles of prothorax evident, though more or less rounded at tip (figs. 15N–P, 21H) 54

– Hind angles of prothorax completely obsolete or very broadly rounded (least in *arcuaticollis*, fig. 15E) 57

54 Prothorax narrow (fig. 21H). Microsculpture meshes of elytra several times as wide as long. Japan . . . . . 48. **darlingtoni** sp. n,

— Prothorax broader (figs. 15N–P). Microsculpture meshes of elytra only slightly transverse 55

55 Prothorax (fig. 15P) with sides evenly rounded from base to apex, widest about middle. Formosa . . . . . 35. **laticollis** sp. n.

— Prothorax (figs. 15N–O) with sides less rounded or even straight in the basal half, greatest width before middle 56

56 Basal foveae of prothorax with a small tubercle in the middle. Basal margin of elytra strongly arcuate. Wings reduced. Formosa 34. **minimus** sp. n.

— Basal foveae flat. Basal margin of elytra little arcuate. Wings full. India . . . . . 33. **pallipes** Andrewes

57 Elytra iridescent, their microsculpture consisting of transverse lines which may form meshes several times as wide as long 58

— Elytra not iridescent, microsculpture meshes not more than three times as wide as long 61

58 Prothorax broadly deplanate along side-margin from base to apex (fig. 15F). Japan and mainland . . . 22. **agonus** Tschitschérine

— No lateral depression of prothorax in the apical third 59

59 Greatest width of prothorax at the middle (fig. 15G). Basal foveae deep, linear, separated from side-margin by a strong convexity. Japan and mainland . . . . . 23. **orbicollis** Morawitz

— Prothorax widest before middle. Basal foveae rounded, shallow. Japan 60

60 Prothorax distinctly deplanate along side-margin in entire basal half (fig. 15J) . . . . . 27. **montanus** sp. n.

— Lateral deplanation of prothorax narrower and well-defined in the basal fourth only . . . . . 28. **narae** sp. n.

61 Prothorax broader (fig. 15E), more shining owing to weaker microsculpture, consisting of clearly transverse meshes. Wings fully developed 21. **arcuaticollis** Motschulsky

— Prothorax (formed as in fig. 15J) with strong microsculpture, formed by more or less isodiametric meshes. Wings rudimentary 29. **tristis** sp. n., var.

The *nitidus* Group.

(*Crepidactyla* Motschulsky, 1861 : 4–5, type *nitida* Mtsch. ; *Fürthius* Jedlička, 1953 : 106, type *cycloderus* Bts.)

Large species (9·9–16 mm.). Terminal segment of labial (sometimes also of maxillary) palp more or less dilated, varying according to the sex. Legs, especially the tarsi, slenderer than in the *nivalis* group. Meso- and meta-tarsi with furrows on both sides, the external ones very deep, defined laterally by a sharp ridge, as in *Calathus* s. str. Mentum tooth less clearly bifid in this group than in all the following ; in *nitidus* particularly it is often almost simple, though truncate and more or less sinuate at apex.

1. *Synuchus nitidus* Motschulsky.

Crepidactyla nitida Motschulsky, 1861 : 5–6.

The original description, especially of the iridescent elytra, seems to fit the present species only.

Deep black, margins of prothorax sometimes diffusedly brownish, prothorax and elytra strongly iridescent ; mouth-parts, antennae and legs brown, femora almost black. Prothorax (fig. 6A) almost circular, with slightly protruding front-angles and completely obliterated hind-angles ; basal setigerous puncture widely removed from the margin ; basal foveae deep, obliquely prolonged almost to the middle. Elytra with arcuate basal margin but only slightly produced and broadly rounded or very obtusely angulate shoulders ; the striae very deep throughout, crenulate owing to a row of minute but sharply

impressed micro-punctures, the intervals very convex; side-margins almost inconspicuously sinuate before apex. Microsculpture of prothorax and elytra consisting of extremely dense transverse lines (which form no clear meshes); hence the strong iridescence. Hind-wings fully developed and functional; one specimen being taken at light by S. Uéno

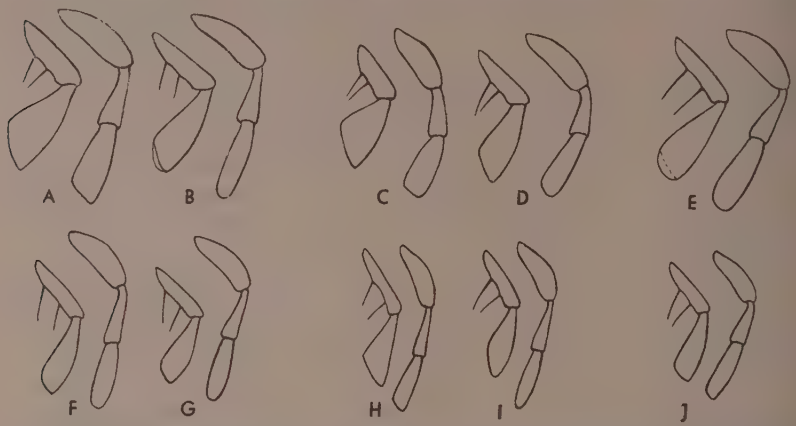

FIG. 5.—Palps of: A, *Synuchus nitidus* Mtsch. f. typ. ♂ (Japan, Hyogo); B, ditto ♀; C, *S. nitidus reticulatus* subsp. n., ♂ holotype (China, Mokanshan); D, ditto, ♀ allotype; E, *S. gravidus* sp. n., ♂ holotype (China, Tienmushan); F, *S. cycloderus* Bts., ♂ (Japan, Kamikôchi); G, ditto, ♀ (Japan, Unsen); H, *S. melantho* Bts., ♂ (Japan, Chuzenji); I, ditto, ♀ (Japan, Sapporo); J, *S. formosanus* sp. n., ♂ holotype (Formosa).*

* It should be noted that the apical edge of the palps is membranous and individually more or less protruding in dead specimens.

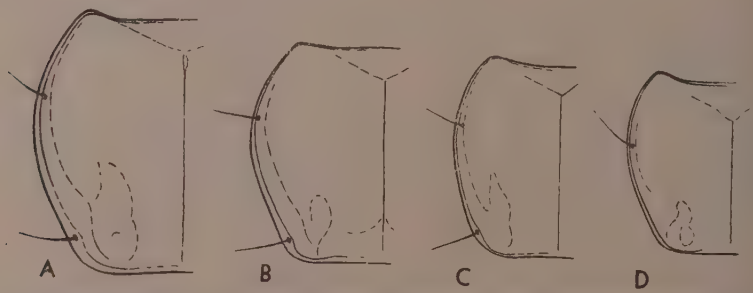

FIG. 6.—Prothorax of: A, *Synuchus nitidus* Mtsch. f. typ. (Japan, Toyanaka); B, *S. cycloderus* Bts. (Korea); C, *S. melantho* Bts. (Japan, Sapporo); D, *S. formosanus* sp. n., holotype (Formosa).

(Pref. Osaka, 24.vi.54). Palpi stout (figs. 5A, B), the terminal segment of both labial and maxillary palps dilated in the male. Aedeagus, fig. 9A. *Length*: 12·3–16·0 mm.

Distribution.—JAPAN: Kyushu. Yakushima Island, Kosugidani, 16.vii.36 (*Y. Yano*, coll. Uéno); Tanegashima Island, Nishinoomote, 6.v.13 (slightly teneral) (*J. E. A. Lewis*, coll. Uéno). Honshu, Pref. Hyogo, Maiya-san (*G. Lewis*, BMNH). Pref. Osaka, Minoo, 25.x.40, 13.x.46, 14.x.48 (*S. Uéno*);

Nose-Hattani, 13.vii.47 (*Y. Shintani*), 13.vii.48, 3 ex. (1 slightly teneral) (*S. Uéno*); Toyanaka, Okumachi, 2.xi.49, 24.vi.54 (slightly teneral) (*S. Uéno*); Minami, Toneyama, 22.vi.48 (*S. Uéno*). Pref. Nara, Mt. Kasuga, 23.ix.48 (*S. Uéno*). Pref. Mie, Mt. Ohdaigahara, Ohsugidani, 9.vi.52 (*H. Ishida*, coll. Uéno). Pref. Shiga, Otsu, 2.xi.50 (*S. Uéno*). Pref. Nagano, Hideshio, 4.viii.51 (*S. Uéno*); Mt. Ontake, Ohtakiguchi 1300 m., 2.viii.53 (*S. Uéno*). Sado Island, ix.98 (*R. P. Faurie*, MNP). Pref. Aomori, Kawachi (Bates, 1873 : 273); Ikarigasaki (coll. J. Breit, MGF). Hokkaido, Hakodate (Morawitz, 1863*b* : 40); pref. Sapporo, Jozankei, 22.vii.26 (*E. Suenson*). Korea: 1893 (MNW). The species was also reported from Formosa (Miwa, 1931) but this requires confirmation.

Synuchus nitidus **reticulatus** subsp. n.

A continental form of *S. nitidus*, differing in that the elytra are only slightly and the prothorax not at all iridescent: microsculpture lines coarser, only half as dense as in *forma typica* and showing a marked tendency (on the prothorax as well as on the elytra) to fuse and form narrow, clearly transverse meshes. Penis (fig. 9B) externally identical, as also are the palps (fig. 5C, D), except that terminal segment of labial palps is perhaps still broader in the male. In internal sac of penis, an elongate area of numerous, sclerotised papillae seems to be a little narrower than in *forma typica*, but is otherwise similar, as are the folds of the soft parts of the sac. *Length:* 12·5–15·0 mm.

Distribution.—China: Prov. Chekiang, Mokanshan, 29.ix.26, ♂ holotype, ♀ allotype; Hangshow, 9.x.21, ♀, 28.x.22, ♂, paratypes (*E. Suenson*). Prov. Fukien, Kwangtse, 1.x.37, ♂ paratype (*J. Klapperich*). Prov. Kiangsu, 2 ♀ paratypes (*K. Kolthoff*, RMS). Prov. Hopei, Ichang on the Yangtse, 2 ♂ paratypes (coll. Oberthür, MNP).

2. **Synuchus gravidus** sp. n. (Fig. 7.)

Large and very broad, especially the prothorax. Deep piceous black, elytra slightly iridescent, sides of prothorax broadly brownish translucent, mouthparts, antennae and legs yellowish-brown, femora darker. Prothorax circular, front-angles less produced than in *nitidus* but more angulate than in *cycloderus*, sides more arcuate than in either, and more broadly reflexed, basal foveae deep and prolonged as in *nitidus* but ill-defined laterally. Elytra even broader and more convex than in *nitidus*, basal margin more arcuate than in *cycloderus*, shoulders completely rounded, the striae very deep with almost inconspicuous rudiments of punctures, intervals as convex as in *nitidus*, the sides sinuate before apex. (In the type, the elytra have three irregularly situated dorsal punctures, all adjoining the second stria, but this may be individual.) Microsculpture on base of prothorax consists of exactly isodiametric meshes, on the elytra of transverse lines with a distinct tendency to form narrow meshes. Hind wings rudimentary, shorter and narrower than one elytron, without reflexed apex. Palps, fig. 5E. Aedeagus, fig. 9C. *Length:* 14·0 mm.

Distribution.—China: Prov. Chekiang, Tienmushan, 2.vii.37, ♂ holotype (*E. Suenson*).

3. *Synuchus cycloderus* H. W. Bates.

Pristodactyla cyclodera Bates, 1873*a* : 273.

The good original description permits identification and I have also seen authentic specimens in the BMNH.

Piceous black, the elytra slightly iridescent, sides of prothorax, mouth-parts, antennae and legs paler brown, femora usually darker. Head narrower than in *nitidus*, the pro-

Fig. 7.—*Synuchus gravidus* sp. n., ♂ holotype (China, Tienmushan).

thorax (fig. 6B) with less produced front-angles and shorter, shallower basal foveae. Elytra with a less arcuate basal margin (fig. 8A), less produced, completely rounded shoulders, shallower striae, which are virtually smooth, less convex intervals, and no preapical sinuation of the side-margin. Basal setigerous puncture of prothorax, as in the two preceding species, separated from side-margin by an interspace equal to or greater than its own diameter. Microsculpture on base of prothorax consists of irregularly isodiametric or

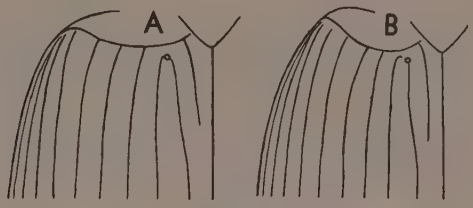

FIG. 8.—Shoulder of: A, *Synuchus cycloderus* Bts. (Korea); B, *S. melantho* Bts. (Japan, Sapporo).

slightly transverse meshes with some tendency to arrangement in transverse rows and that on elytra of transverse lines fusing into narrow meshes. As regards the hind wings this species is dimorphic: the wings being fully developed in some specimens and in others reduced to minute scales. Palps (figs. 5F, G) with a less dilated terminal segment than in other *Crepidactyla* species (more so, curiously enough, in the female), which induced Bates to describe the species as a *Pristodactyla*, and Jedlička (1953: 106) to make it the type species of his *Fürthius*, which also includes the true "*Pristodactyla*" *agonoides* Bates and *arcuaticollis* Mtsch. Aedeagus, fig. 9D. *Length* 11·5–14·0 mm.

Distribution.—JAPAN: Kyushu. Pref. Nagasaki (ZMC), Unsen, 21–22.v.26 (teneral), 26.viii.26, 7–9.vii.34, 28.viii.35, 31.viii.37 (*E. Suenson*). Honshu. Pref. Hyogo, Rokkosan, 16.ix.35 (*E. Suenson*); Kobe, vi.81 (BMNH). Pref. Wakayama, Mt. Iwawaki, 24.vii.49; Mt. Kôyasan, 22.viii.46 (*S. Uéno*). Pref. Nara, Mt. Kasuga, 3.vii, 4.ix.49 (*S. Uéno*). Pref. Mie, Shimajiyama, Ise, 4.v.54 (teneral) (*S. Uéno*). Pref. Osaka, Minoo, 13.x.46, 8.vi.47; Toyanaka, Okamachi, 14.vi., 8.vii.49 (*S. Uéno*). Pref. Kyoto, x.45 (*P. J. Darlington*, MCZ), Toriimoto, 9.vii.49 (*S. Uéno*). Pref. Nagano, Kamikôchi, ix.34, ix.35, vii.39, numerous (teneral 13.vii., 30.vii.) (*E. Suenson*); Nakasawa, Hata-mura, 7.viii.51; Mt. Nishihotaka, 1900 m., 30.viii.53; Kaida, 1000 m., 3.viii.53; Hideshio, 4.viii.51; Utsukushigahara, 2000 m., 5–6.viii.51; Iriyamabe-mura, Daimon-zawa, 5.viii.51; Mt. Ontake, Yashikino, 1000 m., 20.vii.52, Ohtakiguchi, 1300 m., 2.viii.53, Kurosawaguchi, 1000 m., 20.vii.52, 1400 m., 2.vii.52 (2 teneral), 1600 m., 10.viii.51 (teneral), 1800 m., 11.viii.51 (1 teneral) (*S. Uéno*). Pref. Gumma, Oze Hasezawa, 7.viii.50 (*S. Uéno*). Pref. Totshigi, Nikko, Chuzenji, viii.81 (*G. Lewis*, BMNH). Pref. Fukushima, Futamatazawa, Yumoto-mura, 17.vii.49, 3 ex. (all teneral) (*S. Uéno*). Pref. Aomori, Hirosaki, Iwakisan (*G. Lewis*). Hokkaido, Hakodate, ix–x.80, 2 ex. (BMNH). KOREA: Kongosan, 10.x.29, 9 ex. (*E. Suenson*). The Korean specimens are all macropterous which indicates a recent dispersal from Japan by flight. Bates (1873) reports the species from CHINA: Prov. Fukien, Foochow, but this requires confirmation.

4. *Synuchus melantho* Bates.

Crepidactyla melantho Bates, 1883 : 254.

This species is easily identified from the description ; I have also seen authentic specimens in the BMNH.

The smallest and narrowest species of the group. Coloured as *cycloderus*, with which specimens with unusually broad prothorax may be confused. Distinguished as follows : Prothorax (fig. 6C) with the sides less arcuate and less reflexed, the basal setigerous puncture situated close to the side-margin. Elytra more dilated posteriorly, their basal margin more arcuate (fig. 8B), the shoulders markedly angulate, the side-margin slightly sinuate before apex. Palps (figs. 5H, I) slenderer, but more dilated in the male. Microsculpture as in *cycloderus*. *S. melantho* also shows wing-dimorphism, the hind wings being either fully developed or reduced to a tiny scale. Aedeagus, fig. 9E. *Length :* 9·9–13·0 mm.

Distribution.—Japan : Honshu. Pref. Yamanashi, Shoji, 1000 m., 18.viii.26 (*E. Suenson*). Pref. Nagano, Kamikôchi, 5.vii., 3 ex. (2 teneral), 28.vii.39

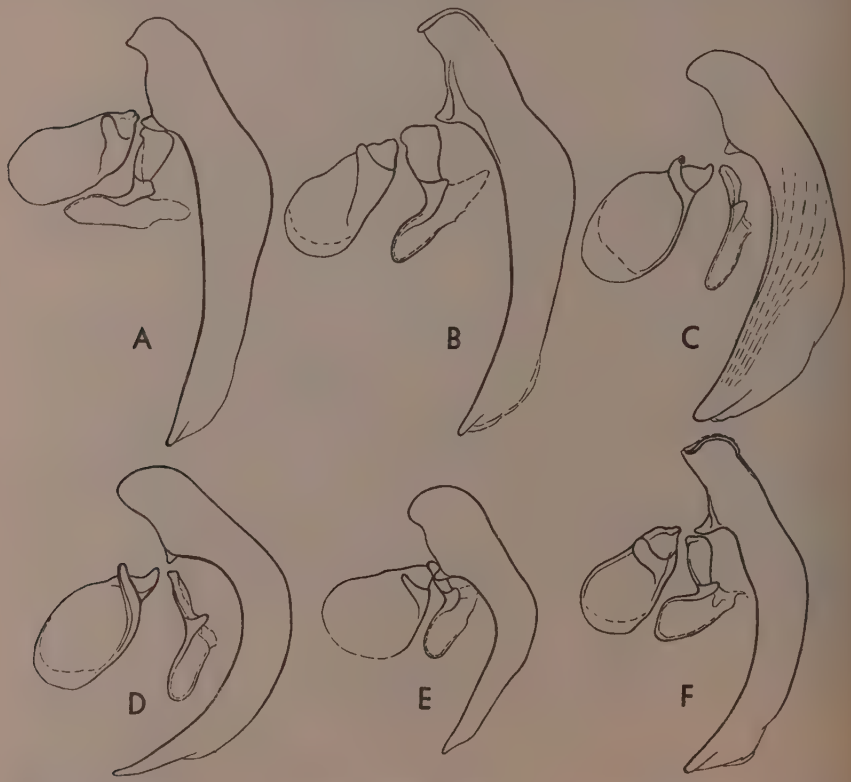

Fig. 9.—Aedeagus of : A, *Synuchus nitidus* Mtsch. f. typ. (Japan, Hakodate) ; B, *S. nitidus reticulatus* subsp. n., holotype (China, Mokanshan) ; C, *S. gravidus* sp. n., holotype (China, Tienmushan) ; D, *S. cycloderus* Bts. (Korea) ; E, *S. melantho* Bts., paratype (Japan, Chuzenji) ; F, *S. formosanus* sp. n., holotype (Formosa).

(*E. Suenson*), 1550 m., 29–31.vii.53, 7 ex. (*S. Uéno*); Tokugô-tôge, 1400 m., 28.vii.53, 2 ex. (1 teneral) (*S. Uéno*); Kaida, 1000 m., 3.viii.53, 2 ex. (*S. Uéno*); Ohgahana, 2000 m., 6.viii.51, 2 ex. (*S. Uéno*); Shiojiri, 4.viii.51 (*S. Uéno*); Mt. Nishihotaka, 1800 m., 30.vii.53 (*S. Uéno*); Nakasawa, Hatamura, 7.viii.51 (*S. Uéno*); Daimonzawa, Iriyamabe, 5.viii.51 (*S. Uéno*); Utsukushigahara 2000 m., 6.viii.51, 4 ex. (*S. Uéno*); Mt. Yaké, 21.viii.49 (*K. Simizu*, coll. Uéno). Pref. Totshigi, Nikko, Chuzenji, viii.81 (*G. Lewis*, BMNH). Pref. Fukushima, Futamatazawa, Yumoto-mura, 17.vii.49, 3 ex. (2 teneral) (*Y. Kurosawa*, coll. Uéno). Pref. Aomori, Ikarigasaki (coll. J. Breit, MGF). Hokkaido, Sapporo, vii.80 (Bates, 1883; *G. Lewis*, BMNH); Jozankei, 17–25.vii.26, 3 ex. (*E. Suenson*); Mt. Daisetsu, Sugatamí, 24.vii.52 (*H. Ishida*, coll. Uéno). ? Manchuria: Chikuanshan, 2 macropterous ♂ (coll. J. Breit, MGF). This is the only mainland record and, as there are other obviously wrong locality labels in the Breit collection, confirmation is highly desirable.

The *formosanus* Group.

(*Parcalathus* Jedlička, 1940 : 2–4, type *testaceus* Jedl.)

Easily distinguished by the lack of a setigerous puncture inside hind-angles of prothorax. Palpi more or less dilated (fig. 5J; whether according to the sex, could not be determined). Distribution seems to be restricted to Formosa.

This group is probably most closely related to the preceding (*Crepidactyla*). The penis and parameres of *formosanus* (fig. 9F; the only species known in this respect) are very similar to those of *nitidus* (fig. 9A). The association of *formosanus* with *Parcalathus* and the two species referred to this genus by Jedlička (1940 : 2–4; 1953 : 105) was made according to the description and a habitus drawing of the male type of *rufofuscus* Jedl., kindly sent by the author. Unfortunately, he declined to send his two species for study or to make a genital slide, under the argument: "die Typen sind zum Aufbewahren und nicht zum Vernichten".

5. **Synuchus formosanus** sp. n.

Piceous black, mouth-parts, antennae, tibiae and tarsi paler, brown. Head notably large. Prothorax (fig. 6D) rather flat, strongly narrowed towards the base, widest before middle, front-angles angulate, hind-angles broadly rounded, the base arcuate and margined laterally, basal foveae shallow and diffuse, the sides in front very narrowly reflexed. Elytra with slightly arcuate basal margin, little produced and almost completely rounded shoulders and slight lateral sinuation before apex; the striae deep, with rudiments of micro-punctures, the intervals moderately convex, the third without dorsal punctures. Microsculpture equally strong over the entire upper surface of prothorax and elytra, on the former consisting of more irregular, slightly transverse, on the latter of isodiametric meshes, in neither case arranged in regular transverse rows. Hind-tarsi furrowed on both sides, externally with a sharp ridge, as in the *nitidus*-group. Hind wings reduced so as to be almost indiscernible. Palps, fig. 5J. Aedeagus, fig. 9F. *Length:* 10·3 mm.

Distribution.—Formosa: Rokurinsan, near Mt. Niitaka, 3.vii.38, ♂ holotype (*Y. Yano*, BMNH).

6. *Synuchus testaceus* Jedlička.

Parcalathus testaceus Jedlička, 1940 : 3–4.

Smaller than *formosanus*, pale reddish-brown (? immature). Prothorax less constricted towards the base. Elytra with two dorsal punctures on the third interstice, their micro-

sculpture consisting of transverse rows of slightly transverse meshes. *Length:* 9 mm. (ex Jedlička, *l.c.*, et *in litt.*).

Distribution.—Formosa: Roeichi, only the ♂ holotype known.

7. *Synuchus rufofuscus* Jedlička.

Parcalathus rufofuscus Jedlička, 1940: 4.

Differs from *testaceus* in the basally more constricted prothorax (as in *formosanus*), the strongly transverse microsculpture meshes of the elytra, the internally smooth hind-tarsi, etc. The statement: "Basis und Seitenrand (i.e. of prothorax) ungerandet", is apparently a *lapsus calami* for: "Basis an den Seiten ungerandet"; the drawing of the holotype sent by the author shows the clearly margined sides of the prothorax. *Length:* 9 mm.

Distribution.—Formosa: Nokosan (♂ holotype); Musha (♀ allotype).

The *nivalis* Group.

(*Synuchus* Gyllenhal s. str., type *nivalis* Panz.)

Characterized by the dilated terminal segment of the labial palpi (fig. 10), which is equal in both sexes. Meso- and meta-tarsi with a shallow longitudinal furrow laterally but smooth inside (or with the faintest suggestion of a furrow). Except for *major* (13 mm.) the group contains small or medium sized species (6–10·2 mm.). Eurasia.

The "*Taphria breviuscula*" Mannerheim (1849: 230–231), referred to *Synuchus* s. str. by Tschitschérine (1893: 362), cannot be interpreted from the description. As the author does not describe the labial palpi, its position is quite uncertain. The type is not in the UMH, nor the Chaudoir collection (coll. Oberthür, MNP).

8. *Synuchus nivalis* Panzer.

Carabus nivalis Panzer, 1797, Nr. 19.

Illiger (1798: 197) pointed out that Kugelann's *in litteris* name, adopted by Panzer (*l.c.*), should be "*vialis*", and not "*nivalis*", in which he was followed by several authors, but Schaum (1860: 400) returned to the older

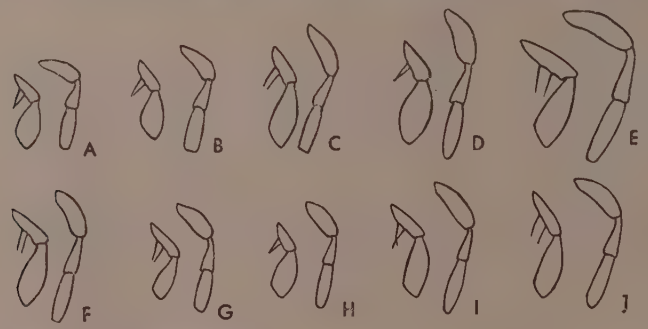

Fig. 10.—Palps of: A, *Synuchus nivalis* Panz. ♀ (S. Siberia); B, *S. simplex* Sem. ♀ (W. Turkestan, Iskander-kul); C, *S. uénoi* sp. n., ♀ allotype (Japan, Nagano); D, *S. chinensis* sp. n., ♀ allotype (China, Kiangsu); E, *S. major* sp. n., ♀ holotype (China, Tienmushan); F, *S. adelosia* Andr., ♂ holotype (India); G, *S. brevis* sp. n., ♂ holotype (China, Tienmushan); H, *S. congruus* Mor., ♂ (China, Shensi); I, ditto, ♂ (Thibet, Kuku-nor); J, *S. nordmanni* Mor., ♀ (Siberia, Amur). (*Vide* footnote, fig. 5.)

name, *nivalis*. This, as well as the German translation "Schnee-Laufkäfer" given by Panzer, is, in fact, most unfortunate for an insect not extending to the alpine region and not surviving the winter as adult. For other synonyms, *vide* Csiki (1931, *in* Junk and Schenkling **115** : 817–818).

Piceous black, side-margins of prothorax and the elytra along the suture usually brownish; mouth-parts, antennae and legs reddish-yellow. Palps stout (fig. 10A), terminal segment of maxillary palps short and truncate. Prothorax convex, with faint median sulcus, deep basal foveae, and very narrow depression along side-margin. Basal margin of elytra slightly arcuate (fig. 11A), the shoulders broadly rounded, the side-margin without preapical sinuation. Claws with 4–5 slender teeth (fig. 11C). Penis (fig. 13A) with spatulate apex. *Length:* 6·0–8·5 mm.

This species shows dimorphism (Lindroth, 1945 : 645) as regards the hind-wings; at least, all specimens are not capable of flight. A reflexed apical part is always present but often so short that the wing cannot be functional. The single record of flight was communicated in a letter from K. Barner (Eickum, Germany), who observed a specimen coming to light at his home.

Distribution.—The range of this species is wider than in any other *Synuchus* (Lindroth, 1945 : 644). It is found over almost the whole of Europe, north to the Polar Circle (fig. 37), south to the Iberian and Apennine Peninsulae; it occurs also in Caucasia and in Siberia, east at least to the Baical region. I have seen the following specimens from Asia (Siberia): Barnaul, River Ob (*H. Frieb*, MGF); Upper Jenissej (*F. Jensen*, UMO); Osnatjennaja (*K. Ehnberg*, UMH); Irkutsk (coll. Bates, in coll. Oberthür, as *congruus*, MNP). The records from the Amur region (Heyden, 1893 : 17) and W. Turkestan (Heyden, 1880–81 : 27) require confirmation; the latter is possibly due to a confusion with *simplex*.

Ecology.—A slightly xerophilous species, occurring in open places or at the edge of woods, under hedges, etc., where the vegetation is sparse and thin; often on fallow-fields with pronounced weed-vegetation, and under *Calluna*. It prefers sandy or gravelly soil, often with a mixture of clay or humus, sometimes occurring in gravel pits (Lindroth, 1945 : 645). The biology of the species will be discussed below, together with a description of the larva (p. 561).

9. *Synuchus simplex* Semenov.

Synuchus simplex Semenov, 1891 : 267–268.

Very closely related to *nivalis*, and perhaps only subspecifically distinct, but distinguished by the rudimentary serration of the claws (fig. 11D). Though, as shown for *impunctatus* (p. 522, fig. 17B), the teeth of the tarsal claws are liable to reduction by tearing during adult life, I have never seen a specimen of *nivalis* with so diffusely serrulate claws

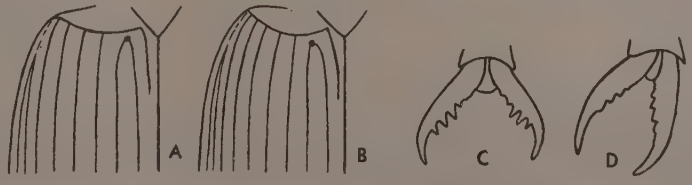

Fig. 11.—Shoulder of: A, *Synuchus nivalis* Panz. (Sweden); B, *S. congruus* Mor. (Japan, Chuzenji). Hind-claws of: C, *Synuchus nivalis* Panz. (S. Siberia); D, *S. simplex* Sem. (W. Turkestan, Iskander-kul).

as in *simplex*, and thus regard the character as constant. Semenov (*l.c.*) described the claws as " omnibus simplicibus, interne omnino integris " but Tschitschérine (1893 : 362) indicated them as " laeves (an indistincte serrati ?) ". Actually, the four specimens seen by me, including a female from *locus classicus* (Iskanderkul) identified by Semenov himself, possess distinct rudiments of teeth, as shown in the figure. The species is on an average larger than *nivalis*. The elytra are longer, more parallel-sided, with slightly more angulate and usually more prominent shoulders. In the specimens studied the hind wings are developed but weak. The penis (fig. 13B), as already stated by Semenov (*l.c.*), is very little different from that of *nivalis*. *Length :* 7·0–8·8 (? –10, according to Semenov) mm.

Distribution.—West Turkestan : Iskander-kul, a lake about 2500 m. in the Hissar (Gisar) Mts., 1888, ♀ (*Semenov*, l.c.) ; Narvai, 1892, ♀ (*Glasunov*, MNW) ; Prov. Darvas, Pischcharf on River Amu Darja, 1889, ♂ (*Semenov*, l.c.) ; Margelan, ♀ (*Reitter*, MGF) ; Tienshan, Musart, ♂ (coll. Hauser, MNW) ; Semirjetschensk, Talas Valley, ♀ (*B. Kricheldorff*, MNW).

10. **Synuchus uenoi** sp. n.

Likewise closely related to *nivalis* but stouter and more convex. The antennae, especially the apical segments, shorter. Elytral striae deeper, the interstices more convex. Terminal segment of all palps more slender (fig. 10C). Easily distinguished by the microsculpture of the elytra, the meshes of which are wide but more or less transverse (only in part isodiametric) and clearly arranged in transverse rows. Hind wings fully developed. Apex of penis (fig. 13C) spatulate, as in the two preceding species, but considerably shorter. *Length :* 7·9–8·0 mm.

Distribution.—Japan : Honshu, Pref. Nagano, Utsukushigahara 2000 m., 6.viii.51, ♂ holotype, ♀ allotype (*S. Uéno*).

11. **Synuchus chinensis** sp. n.

As a rule larger than the three preceding species. Piceous black, side margins of prothorax and elytra, usually also the suture, paler ; mouth-parts, antennae and legs reddish-brown. Prothorax (fig. 12A) with more or less pronounced, irregular, transverse wrinkles over its whole surface ; lateral depression extending along side-margin to front-angles, basal foveae indistinctly defined laterally, prolonged forwards on the disc as arcuate, diverging depressions. Elytra with strongly arcuate basal margin (as in fig. 11B), the striae deep and the inner interstices convex, the side-margin with faint subapical sinuation (lacking in the three preceding species) ; microsculpture as in *nivalis*. Palps, fig. 10D. Legs shorter than in any other species of the group ; the tarsal claws stronger than in *nivalis*. Hind wings fully developed. Penis (fig. 13D) with slightly reflexed, but not spatulate apex. *Length :* 8·5–10·2 mm.

Distribution.—China : Prov. Kiangsu, Soo-chow, 2.x.21, ♂ holotype, 22.v.21, ♀ allotype (teneral) (*E. Suenson*). Prov. Kiangsu (without exact locality), ♀ paratype (*A. David*, coll. Oberthür, MNP, as *Calathus orbicollis* Mtsch.). Prov. Chekiang, Mokanshan, 3.x.26, ♀ paratype (*E. Suenson*). Prov. Fukien, Jen-ping-fu, 17.v.35, ♀ paratype (*E. Suenson*). S. Manchuria : Chikuanshan, ♂ (not designated as paratype, for reasons mentioned under *melantho*) (coll. J. Breit, MGF). In the Suenson collection there is an immature ♀ from Chekiang, 4.vi.20, quite small (7·8 mm.), with still more evident deplanation of the sides of the prothorax. The shape of the palpi agrees exactly and the specimen seems not to be specifically distinct.

12. **Synuchus major** sp. n.

Largest species of the group. Piceous black, strongly shining, suture and margins of prothorax and elytra diffusely reddish, mouth-parts, antennae and legs reddish-yellow, femora and tibiae darkened. Prothorax (fig. 12B) broad, very convex, widest a little before middle, with strongly and evenly rounded sides and completely obliterated hind

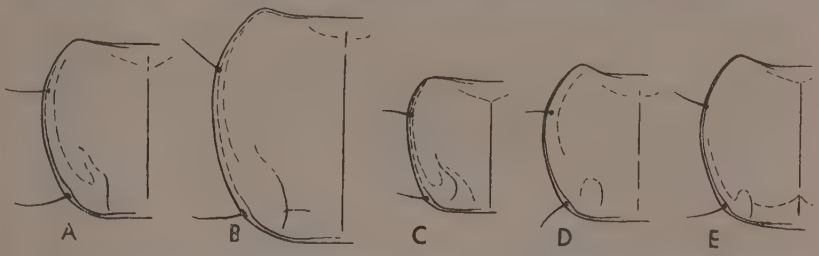

FIG. 12.—Prothorax of: A, *Synuchus chinensis* sp. n., ♀ allotype (China, Kiangsu); B, *S. major* sp. n., ♀ holotype (China, Tienmushan); C, *S. adelosia* Andr., ♂ holotype (India); D, *S. brevis* sp. n., ♂ holotype (China, Tienmushan): E, *S. nordmanni* Mor., ♀ (Siberia, Amur).

angles; basal foveae very much as in *chinensis* but deeper, with a still more pronounced, curved prolongation. Shoulders moderately produced, rounded; elytral striae very deep throughout, the intervals strongly convex. Microsculpture of elytra consists of wide meshes, almost isodiametric on the base, but clearly transverse on the middle. Hind wings fully developed. Palps, fig. 10E. *Length:* 13·0 mm.

Distribution.—CHINA: Prov. Chekiang, Tienmushan, 2.vii.37, ♀ holotype (*E. Suenson*).

13. *Synuchus adelosia* Andrewes.

Calathus adelosia Andrewes, 1934 : 213.

Depressed, coloured as *nivalis*. Greatest width of prothorax (fig. 12C) evidently before middle, the hind-angles more noticeable than in any other species of the group; basal foveae prolonged forwards as a slight, arcuate depression, indistinctly limited laterally and separated from the hind-angles by a pronounced deplanation; the side-margin accompanied by a narrow reflection which reaches the front-angles. Elytra with moderately arcuate basal border, shoulders broadly rounded, slightly prominent; the microsculpture isodiametric, as in *nivalis*. Hind wings fully developed. Palps, fig. 10F. (Andrewes overlooked the dilated terminal segment of the labial palps and placed his species in *Calathus*.) Aedeagus, fig. 13E. *Length:* 8·5 mm.

Distribution.—INDIA: United Provinces, West Almora, 30° N., 80° E., ♂ holotype (BMNH).

14. **Synuchus brevis** sp. n.

Deep, piceous black, side-margins of prothorax clearly translucent, otherwise coloured as *nivalis*. Prothorax (fig. 12D) broad, with protruding front-angles, strongly, evenly rounded sides, and short, very deep basal foveae which are separated from the side-margin by a pronounced convexity; lateral reflexion broad and very pronounced, only slightly narrowed apically, where it reaches the front-angles. Elytra shorter than in other members of the group, with deep striae and the intervals strongly convex throughout; basal margin

arcuate, the shoulders produced, almost angulate ; microsculpture consisting of very dense transverse lines (as in *nordmanni*). Hind wings rudimentary, narrower than one elytron and two-thirds its length, abruptly truncate outside the stigma. Palps, fig. 10G. Penis (fig. 13F) strikingly asymmetric. *Length :* 8·3–8·5 mm.

Distribution.—China : Prov. Chekiang, Tienmushan, 25.vi. (1050 m.) and 30.vi.37, ♂ holotype and ♂ paratype (*E. Suenson*).

15. *Synuchus congruus* Morawitz.

Taphria congrua Morawitz, 1862 : 205 ; 1863*a* : 249. (*? latus* Tschitschérine, 1893 : 361).

The interpretation of Morawitz' name seems clear from his description of the humeri. I have seen a male (UMH), labelled " Terr. Ching. Chan., Nordmann jun.". This is probably a " cotype ": the *locus classicus* is given as " Bureja-Gebirge " (Radde and Arthur Nordmann). The head and prothorax are missing but the aedeagus and microsculpture of the elytra are characteristic.

General appearance and colour of *nivalis*. Basal foveae of prothorax less defined laterally and separated from the hind-angles by a depression which extends forwards along the side-margin as a narrowing reflection, at least to the middle of prothorax. Shoulders of elytra, though somewhat variable, always strongly protruding and angulate (fig. 11B). Transverse lines of elytral microsculpture not quite as dense as in *nordmanni* and showing

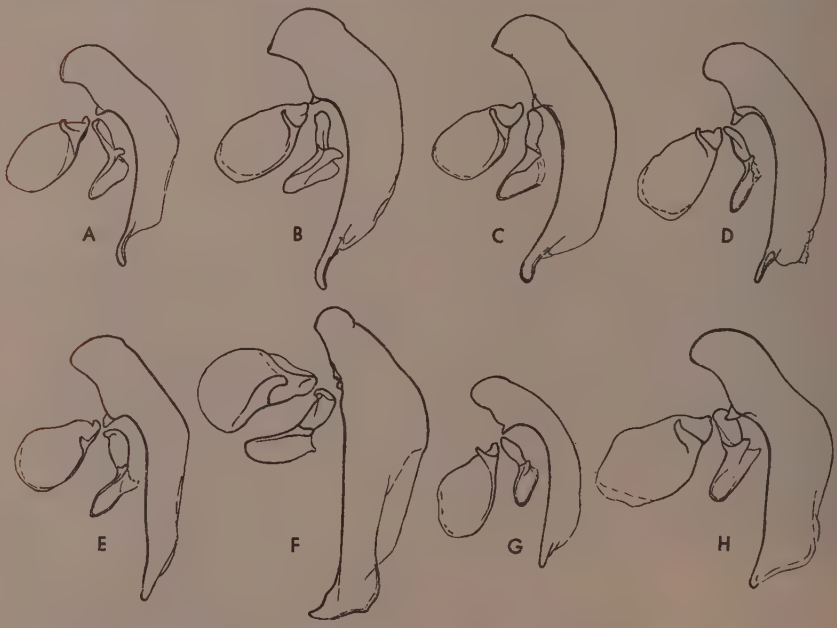

Fig. 13.—Aedeagus of : A, *Synuchus nivalis* Panz. (Sweden) ; B, *S. simplex* Sem. (Siberia, Tienshan) ; C, *S. uénoi* sp.n., holotype (Japan, Nagano) ; D, *S. chinensis* sp. n. (S. Manchuria) ; E, *S. adelosia* Andr., holotype (India) ; F, *S. brevis* sp. n., holotype (China, Tienmushan) ; G. *S. congruus* Mor. (Siberia, Amur) ; H, *S. nordmanni* Mor. (Siberia, Vladivostok).

a more definite tendency to form very transverse meshes. Hind wings fully developed but comparatively small; probably, as in *nivalis*, at least not all specimens are capable of flight. Aedeagus, fig. 13G.

This species varies a good deal in size (7·3–9·6 mm.: in Japan on an average smaller than on the mainland), in prominence of the shoulders, and in the form of the palps (figs. 10H, I). The terminal segment of the labial palps is notably slender in a pair from Kuku-Nor, as well as in some large specimens from Hopingtse and Wutaishan, China. In the two first-named specimens the legs seem slightly darkened (? post-mortem), the prothorax and the elytra are a little less convex than usual; but the microsculpture of the elytra and the male genitalia are quite normal. According to the description this seems to be the form described by Tschitschérine (1893 : 361–363) as *latus* but I am unable to decide if it should be subspecifically separated.

Distribution.—Japan: Kyushu, Nagasaki (Bates, 1873 : 274; ♀, MNP). Honshu, Kyoto, x.45, 3 ex. (*Darlington*, MCZ). Pref. Nara, Mt. Kongo, 21.ix.48 (*S. Uéno*). Osaka, Toneyama, 6.vii.50 (*S. Uéno*). Pref. Shisuoka, Mt. Fuji, x.45, 4 ex. (*Darlington*, MCZ). Pref. Totshigi, Nikko, Chuzenji, viii.81 (*G. Lewis*, BMNH, as *dulcigradus*). Pref. Aomori, Karasuzawa, Yamagata-mura, 24.ix.47 (*S. Uéno*). Siberia: Vladivostok, 2 ♀ (*H. Frieb*, MGF). Lower Amur (*loc. class.*; Heyden 1884 : 288; UMH). Upper Jenissei, Abakansk (*Hammarström, K. Ehnberg*, UMH); Osnatjennaja (*K. Ehnberg*, UMH). Thibet: Kuku-Nor, ♂♀ (*Koltze*, MNW, DEI). S. Manchuria: Chikuanshan, ♂ (coll. J. Breit, MGF). China: Prov. Shensi, Tsinlingshan, Hopingtse, 1100–1200 m. 13–15.vii.36, 2 ex. (1 immature) (*U. G. Dong*, coll. Suenson). Prov. Shansi, Wutaishan, about 2000 m., 18.viii.–2.ix.29, 26 ex. (*E. Suenson*).

16. *Synuchus nordmanni* Morawitz.

Taphria nordmanni Morawitz, 1862 : 204; 1863*a* : 248.

Morawitz' species is easily identified from his good description. I have seen a female, labelled "Terr. Ching. Chan., Nordmann jun." (UMH), which is probably a "cotype" (the *loc. class.* is called "Bureja-Gebirge").

Larger, broader and more convex than *nivalis*, usually darker, femora normally more or less darkened (rarely head and prothorax brownish). Prothorax (fig. 12E) very much as in *congruus* but more convex, the base heavily micro-reticulated throughout and therefore dull. Shoulders produced and more or less angulate, though usually less than in *congruus* (fig. 11B); striae deeper and the intervals more convex than in any other species of the group except *brevis*; microsculpture very dense, its transverse lines with almost no tendency to fuse into meshes, the elytra therefore more markedly iridescent than in any other *Synuchus* s. str. Palpi (fig. 10J) almost as slender as in *intermedius* (fig. 14A), which, however, is easily distinguished by the microsculpture of the elytra and the preapical sinuation of the sides. Hind wings fully developed. Aedeagus, fig. 13H. *Length* 9·0–9·5 mm.

Distribution.—Japan: Hokkaido. Ichinohashi, Kamikawa, 2.viii.51, ♀ (*A. Nobuchi*, coll. Uéno). Siberia: Amur region (*loc. class.*, UMH); Sotka-Gora, ♂ (*v. Bodemeyer*, DEI); Vladivostok, ♂♀ (*Schoulz*, UMH). Manchuria: Mukden, 10.viii.22, ♂ (*E. Suenson*). China: Prov. Shansi, Wutaishan, 18.viii., 20.viii., 31.viii., 2.ix.29, 4 ex. (*E. Suenson*).

The *impunctatus* Group.

(*Pristodactyla* Dejean, 1828 : 82–83, type *impunctata* Say ;
Fürthius Jedlička, 1953 : 106, vide *nitidus*-group)

Separated from the *nivalis*-group only by the less dilated terminal segment of the labial palps. In *crocatus* and *intermedius* (figs. 14A, B), however, this is almost as broad as in the least pronounced "*Synuchus* s. str." (*nordmanni*, fig. 10J) and the dividing line between the two groups is essentially more practical than natural. On the other hand, the present group has a rather checkered content and could perhaps be subject to further division, as indicated below. The remaining groups of the genus are distinguished from "*Pristodactyla*" by the special characters mentioned under each.

17. **Synuchus intermedius** sp. n.

Like *crocatus* Bates, this species forms a link between *Synuchus* s. str. and "*Pristodactyla*", as seen in the moderately enlarged terminal segment of the labial palps (fig. 14A). I received the species from UMH as "*latus* Tsch."

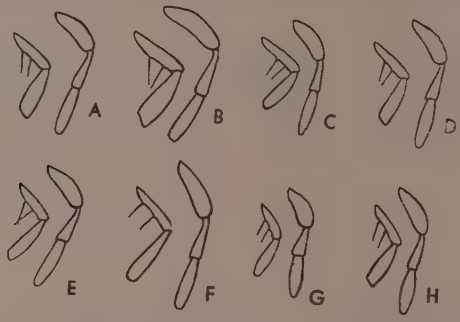

Fig. 14.—Palps of: A, *Synuchus intermedius* sp. n., ♂ paratype (China, Shensi); B, *S. crocatus* Bts., ♂ paratype (Japan, Sapporo); C, *S. agonoides* Bts., ♂ (China, Shensi); D, *S. dulcigradus* Bts. ♂ (Japan, Unzen); E, *S. arcuaticollis* Mtsch. ♂ (Japan, Kyoto); F, *S. impunctatus* Say ♂ (Newfoundland); G, *S. darlingtoni* sp. n., ♂ paratype (Japan, Fuji); H, *S. rectangulus* sp. n., ♂ holotype (Formosa).

(Vladivostok) but the identification must be wrong; Tschitschérine would certainly not have overlooked the much less enlarged labial palps in the present species.

Notably slender. Piceous black, margins of prothorax and elytra (including the suture) brown, mouth-parts, antennae and legs red. Prothorax (fig. 15A) very shiny (microsculpture almost obsolete on the disc), with completely rounded hind angles, the basal foveae deep, linear, separated from the side-margin by a strong convexity, which is more or less interrupted in the middle. By this character (as well as the labial palpi) *intermedius* is easily distinguished from the otherwise similar *agonoides* from the same region. Elytra with produced, though rounded shoulders, striae deep, the inner interstices evidently convex. Microsculpture consists of irregularly isodiametric, in places very slightly transverse, rather weak meshes, which show no tendency to form transverse rows. Hind tarsi furrowed on both sides but the internal groove shallow, sometimes obsolete. The species shows wing-dimorphism: as a rule the hind wings are reduced to an extremely small, triangular rudiment; but I have seen five specimens (four from Hopingtse and one from

Vladivostok) which possess fully developed and probably functional wings. Aedeagus, fig. 16A. *Length:* 8·4–10·8 mm.

Distribution.—China: Prov. Shensi, Tsinlingshan Mts., Hopingtse, 1100–1200 m., 13–16.vii.36, ♂ holotype and 9 paratypes, Chinsagong, 8–900 m., 2.vi.36, ♂ paratype, Chunshantse, 1500 m., 17–18.vi.36, ♀ allotype and 3 paratypes (*U. G. Dong*, coll. E. Suenson). S. Manchuria: Antung, 1 ex., Chikuanshan, 4 ex. (paratypes, MGF). Korea: without exact locality, quite immature ♀ (*Herz*, coll. Sievers, DEI). Siberia: Vladivostok, ♂ paratype (*Schoulz*, UMH).

18. *Synuchus agonoides* Bates.

Pristodactyla agonoides Bates, 1889*b*: 218.

The single male type (Ichang, coll. Bates, MNP) agrees completely with the specimens from Shensi, except that in the former the three basal segments of the antennae are piceous, darker than the remaining segments. This may be due to post-mortem changes, and may even have occurred after the description, in which the antennae are said to be "rufescentibus", was made.

Closely related, in spite of the almost non-dilated labial palps (fig. 14C), to *intermedius* but smaller, even more shining due to weaker microsculpture, which is quite regularly isodiametric on the elytra and completely obsolete (or almost so) on disc of prothorax. Eyes flatter, the prothorax more constricted basally (fig. 15B), with more suggestion of hind-angles; basal foveae shorter and the convexity separating them from the side-margin not interrupted. Internal furrow of hind-tarsi extremely shallow or completely obsolete. Hind-wings appear always to be reduced to an almost invisible rudiment. Aedeagus, fig. 16B. *Length:* 7·3–8·3 mm.

Distribution.—China: Prov. Hopei, Ichang on the Yangtse (*loc.class.*). Prov. Shensi, Tsinlingshan Mts., Hopingtse 1100–1200 m., 12–16.vi.36, 7 ex. (rather immature) together with *intermedius* (*U. G. Dong*, coll. E. Suenson).

19. *Synuchus crocatus* Bates.

Pristodactyla crocata Bates, 1883: 288.
Crepidactyla shirahatai Habu, 1954*b*: 239–241.

I have seen the male from Hakodate, marked as "type" (BMNH), and made a slide of the genitalia. Habu's name is easily interpreted from his excellent drawing of the habitus and the labial palp.

Broader than *intermedius*, similarly coloured and with the same dilation of the terminal segment of the labial palp (fig. 14B). Easily distinguished by the absence of a convexity separating basal fovea of prothorax from side-margin (fig. 15C), and by the microsculpture, which is evident even on the prothoracic disc (slightly transverse meshes). Meshes on elytra strong, irregularly isodiametric or very slightly transverse, with some tendency to form irregular transverse rows. The species may be confused with either *dulcigradus* (which agrees in microsculpture) or *arcuaticollis*, though clearly different from both in labial palpi as well as in penis. From *dulcigradus* it is also distinguished by the narrower head, broader prothorax, and the normal sutural angle of elytra (cf. fig. 18A); *arcuaticollis* is separated by the clearly transverse microsculpture meshes of its elytra. The species shows wing-dimorphism: in the short-winged form the wings are quite rudimentary; the macropterous form has strong, normal wings (both seen from Pref. Nagano). Aedeagus, fig. 16C. *Length:* 9·1–11·9 mm. (hence unusually variable in size.)

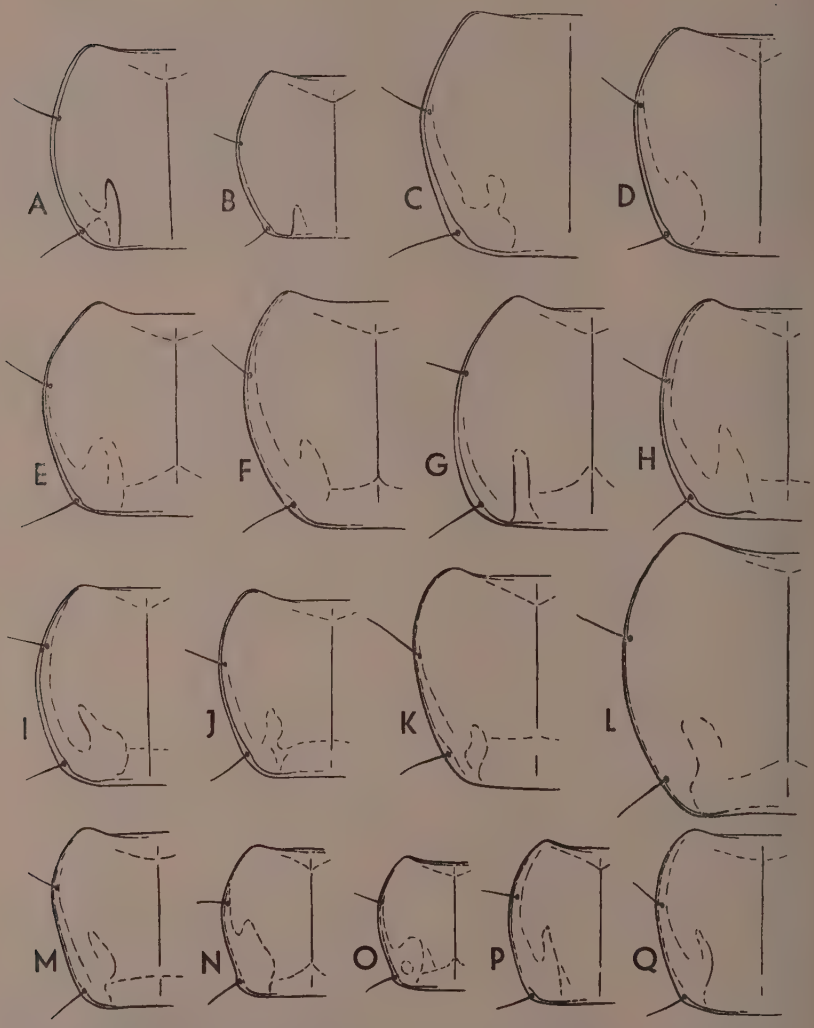

Fig. 15.—Prothorax of: A, *Synuchus intermedius* sp. n., allotype (China, Shensi); B, *S. agonoides* Bts. (China, Shensi); C, *S. crocatus* Bts., paratype (Japan, Sapporo); D, *S. dulcigradus* Bts. (Japan, Osaka); E, *S. arcuaticollis* Mtsch. (China, Hangchow); F, *S. agonus* Tsch. (Korea); G, *S. orbicollis* Mor. (China, Shensi); H, *S. limbalis* sp. n., holotype (China, Chinkiang); I, *S. calathinus* sp. n., paratype (China, Chekiang); J, *S. montanus* sp. n., holotype (Japan, Nagano); K, *S. impunctatus* Say (Newfoundland); L, *S. dubius* Lec. (U.S.A., Colorado); M, *S. semirufus* Csy. (Mexico, Durango); N, *S. pallipes* Andr., paratype (India); O, *S. minimus* sp. n. holotype (Formosa); P, *S. laticollis* sp. n., holotype (Formosa); Q, *S. suensoni* sp. n. allotype (China, Fukien). Equal magnification.

Distribution.—JAPAN: Honshu. Yokohama (Bates, *l.c.*). Pref. Nagano, Mt. Ontake, Miure 1300 m., 19.vii.52, 2 ex., Kurosawaguchi, 1700 m., 5.viii.53 (*S. Uéno*); Kaida 1000 m. 3.viii.53 (*H. Kiyosawa*, coll. Uéno). Pref. Gumma, Numata, 5.iv.51 (immature) (*T. takei*, UML). Pref. Fukushima, Kotoribi, Narahara-chô, 5.vii.49, ♀ (slightly teneral) (*Y. Kurosawa*, coll. Uéno). Pref. Yamagata, Sakata (Habu, *l.c.*). Pref. Aomori, Sannohe (BMNH). Hokkaido, Hakodate (*loc. class.*); Sapporo, viii.80 (*G. Lewis*, BMNH). This species seems to be rare.

20. *Synuchus dulcigradus* Bates.

Pristodactyla dulcigrada Bates, 1873*a*: 273–274.

I have seen the type (BMNH).

More slender on the average than *crocatus* and *arcuaticollis*, the prothorax (fig. 15D) narrower, with less rounded sides. Easily distinguished by the diverging apices of elytra (fig. 18A). Palps, fig. 14D. Prothorax normally as in fig. 15D, but sometimes with more rounded hind angles. Microsculpture of elytra as in *crocatus*. Penis (fig. 16D) similar to that of *crocatus* but much shorter, with more reflexed apex. Wings apparently always fully developed, strong. *Length:* 8·0–10·3 mm.

Distribution.—JAPAN: Kyushu. Nagasaki (*loc. class.*; ZMC); Unzen 18.v.26, 31.viii.37, 8 ex. (*E. Suenson*); Oita, 15.x.35 (*E. Suenson*). Pref. Fukuoka, Fujinoka, Wakamatsu, 1.i.53, 2 ex. (*M. Nakayama*, coll. Uéno); Mt. Hiko, 2.x.52 (*A. Habu*, BMNH). Honshu, Pref. Yamaguchi, Kuwanemura, 20.vii.52 (*S. Uéno*). Hyogo (Bates, l.c.). Pref. Osaka, Minoo, 8.vi., 2 ex. (teneral), 27.vii.47; Minami-Toneyama, 18.v. (teneral), 17.vii.47, 22.vi.48, 2 ex.; Toneyama, 6.vii.50; Toyonaka, Okamachi, 13.vii.49; Higashi-Toyanaka, 14.xi.44 (*S. Uéno*). Pref. Wakayama, Mt. Iwawaki, 24.vii.49, 3 ex. (*S. Uéno*). Pref. Nara, Mt. Kasuga, 23.ix.48, 27.v.50 (*S. Uéno*). Kyoto, x.45, several (*Darlington*, MCZ). Pref. Nagano, Kaida, 1000 m., 3.viii.53, 2 ex. (*H. Kiyosawa*, coll. Uéno); Aiyoshi, Nakagawa-mura, 18.vi.52 (*S. Uéno*); Iriyamabe-mura, Daimonzawa, 5.viii.51 (teneral) (*S. Uéno*). Pref. Gumma, Numata, 12.xi.37 (*T. Takei*, coll. Uéno). Tokyo, Yoyogi, 7.vi.36, Murayama Park, 22.v.36 (*Y. Yano*, coll. Uéno).

Biology.—From the above data it seems that this species, contrary to what is usual in the genus, may survive the winter not only in the larval, but also in the imaginal stage.

21. *Synuchus arcuaticollis* Motschulsky.

Pristodactyla arcuaticollis Motschulsky, 1860: 7, *sensu* H. W. Bates, 1873*a*: 274.

The name cannot be interpreted from the poor original description and I follow the practice adopted by Bates (confirmed by specimens identified by him, BMNH) of applying Motschulsky's name to the commonest Japanese species of the genus. It must be pointed out, however, that the author ascribed to his species "alis nullis", whereas in *arcuaticollis* sensu Bates, as far as is known, the wings are always fully developed. This would point to *agonus* or, more likely, to the brachypterous form of *crocatus* ("angulis . . . posticis obtusis") but, on the other hand, references to absence of wings by early authors are often incorrect and due to the fact that these have been glued to the underside of the elytra in the specimen studied.

Black or deep piceous, margins of prothorax and elytra (including suture) brownish, mouth-parts, antennae and legs clear reddish. Last segment of labial palps almost cylindrical (fig. 14E). Prothorax (fig. 15E) with the sides more rounded in frontal than in basal half, often almost straight before hind angles, which are strongly obtuse and rounded but (though somewhat variable) always more evident than in *crocatus* and *agonus*. Oblique depression inside hind angles more clearly marked than in *dulcigradus* and more prolonged forwards along the side-margin, though less evident in the frontal half than in *agonus*. Microsculpture of prothorax evident also on the disc, where it consists of slightly transverse meshes; the meshes clearly transverse on elytra, but not more than three times as wide as long. Hind tarsi furrowed on both sides but internal sulcus shallow. Hind wings, as far as is known, always developed, but to a varying degree, especially the apex (outside the stigma); probably, as in *nivalis*, the species is functionally dimorphic. Aedeagus fig. 16E. *Length* (unusually variable in size): 7·7–10·4 mm.

Distribution.—Japan: Kyushu. Yakushima Island, Anbô. 11.iv.12 (*J. E. A. Lewis*, coll. Uéno); Nagasaki (UMB, ZMC); Karatsu 12–19.ix.37 (*E. Suenson*); Oita, 14–16.x.35 (*E. Suenson*); Beppu, 26.iv.15 (*J. E. A. Lewis*, coll. Uéno). Honshu. Pref. Hyogo, Mukogawa, Nishinomiya, Kitaguchi, 1.xi.46 (*S. Uéno*); Mt. Kanten, near Mikage, Kobe, 23.x.49 (*Y. Wada*, coll. Uéno). Pref. Osaka, Hotarugaike, 30–31.v.49; Yodogawa, Moriguchi, 20.vi.49 (*S. Uéno*). Pref. Nara, Mt. Ohdaigahara, Kimmeisui, 20.vii.53 (*H. Ishida* and *S. Uéno*). Pref. Mie, Mt. Ohdaigahara, Ohsugidani, 9.vi.52 (*H. Ishida*, coll. Uéno); Shimajiyama, Ise, 4.v.54 (teneral) (*S. Uéno*). Kyoto x.45 (*Darlington*, MCZ). Pref. Nagano, Kamikôchi, 12–20.ix.34, 13–30.vii.39, abundant (*E. Suenson*), 1550 m., 29–31.vii.53, abundant (*S. Uéno*); Kaida 1000 m., 3.viii.53 (*H. Kiyosawa*, coll. Uéno); Mt. Ontake, Kurosawa, 900 m., 4.viii.53 (*H. Kiyosawa*, coll. Uéno), 1300 m., Miure, 19.vii.52, 1600 m., Kurosawaguchi, 5.viii.53 ((*S. Uéno*); Iriyamabe-mura, Daimonzawa, 5.viii.51; Nakasawa, Hata-mura, 7.viii.51; Kiso-Fukushima, 1.viii.53 (*S. Uéno*); Mt. Shiratori, 25.ix.48 (*A. Nobuchi*, coll. Uéno). Pref. Fukushima, Kotoribi, Narahara-chô, 5.vii.49 (*Y. Kurosawa*, coll. Uéno). Sado Island, Mt. Kimpoku, viii.42 (*H. Takenaka*, coll. Uéno). Pref. Aomori, Mt. Hakkôda, Yachi-Onsen, 800 m., 28.vii.52 (*T. Kishii*, coll. Uéno); Nurugawa, Takedate-mura, 9.v.48 (teneral) (*K. Shimoyama*, coll. Uéno). Hokkaido. Hakodate, 1880 (*G. Lewis*, BMNH); Onuma, 2.vii., 8.vii (teneral) 26 (*E. Suenson*). China: Prov. Chekiang, Tien-mushan, 30.v.37; Chekiang, 19.iv.19, 2 ex. (1 slightly teneral); Hangchow, 27.iv.24 10 ex. (partly teneral), 27.v.28 (*E. Suenson*). I am unable to differentiate between Chinese and Japanese specimens.

22. *Synuchus agonus* Tschitschérine.

Calathus agonus Tschitschérine, 1895*a*: 178–181 (referred to *Eucalathus* by Jacobson, 1906: 324; to *Paradolichus*, with doubt, by Jedlička, 1953: 110).

I have seen no authentic specimen but the description, especially the comparison with *orbicollis*, as well as the country of origin, seem sufficient.

Distinguished from the three preceding species by the almost circular prothorax (fig. 15F) which has completely obsolete hind angles. Small, aberrant specimens with narrower prothorax may be confused with *arcuaticollis* but differ by flatter eyes, by the basal setigerous puncture of prothorax being more removed from the side-margin and the basal foveae completely fused with the depression inside the hind angles, by the denser microsculpture-lines of elytra, which form only indistinct, very broad meshes (more than three

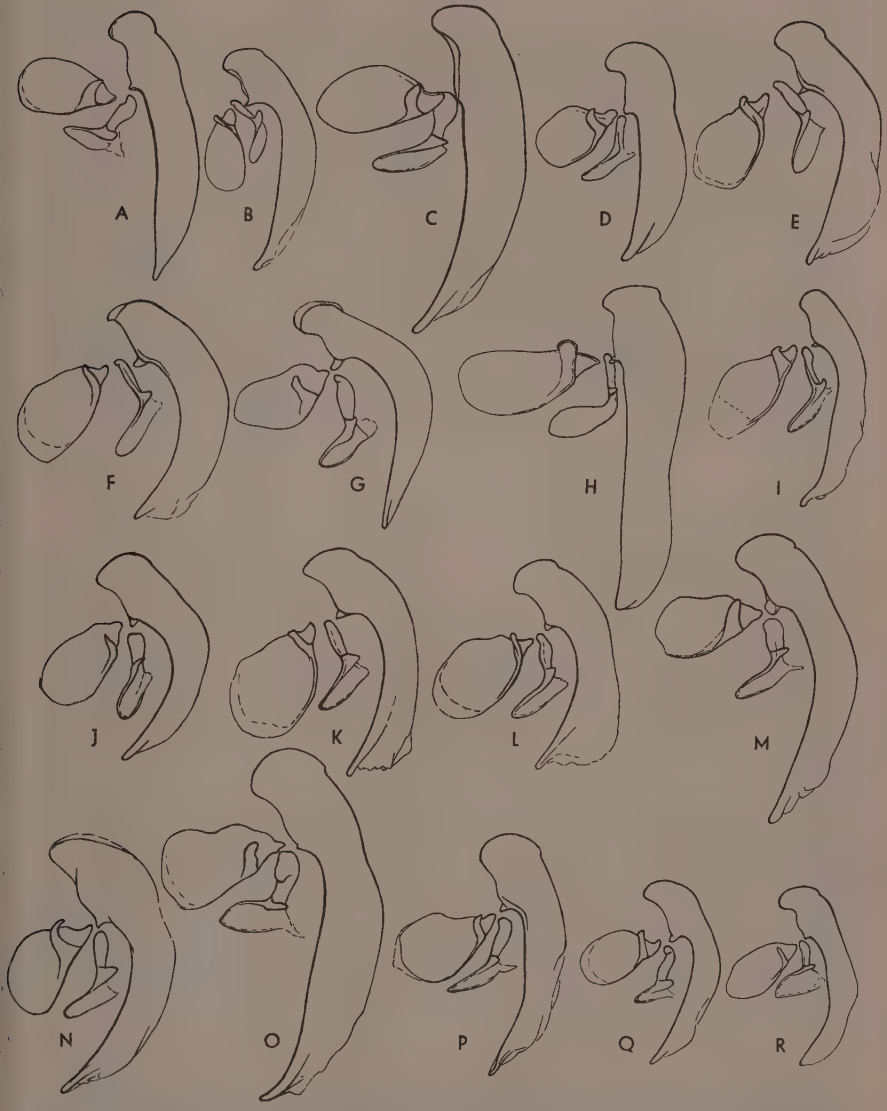

FIG. 16.—Aedeagus of: A *Synuchus intermedius* sp. n., paratype (Siberia, Vladivostok); B, *S. agonoides* Bts. (China, Shensi); C, *S. crocatus* Bts., holotype (Japan, Hakodate); D, *S. dulcigradus* Bts. (Japan, Kyoto); E, *S. arcuaticollis* Mtsch. (China, Chekiang); F, *S. agonus* Tsch.* (Korea); G, *S. orbicollis* Mor. (Manchuria, Mukden); H, *S. limbalis* sp. n., holotype (China, Chinkiang); I, *S. calathinus* sp. n., paratype (China, Chekiang); J, *S. montanus* sp. n., holotype (Japan, Nagano); K, *S. narae* sp. n., holotype (Japan, Nara); L, *S. tristis* sp. n., holotype (Japan, Nagano); M, *S. impunctatus* Say (Newfoundland); N, *S. semirufus* Csy. (Mexico, Durango); O, *S. dubius* Lec. (U.S.A., New Mexico); P, *P. pallipes* Andr., paratype (India); Q, *S. laticollis* sp. n., holotype (Formosa); R, *S. suensoni* sp. n., paratype (China, Fukien).

* The basal part of penis is often broader.

times as wide as long) and produce a clear iridescence ; the femora also, usually more or less darkened. Hind wings appear always to be reduced to an almost inconspicuous rudiment. Penis (fig. 16F) differs from that of *arcuaticollis* in its even ventral curvature, the right paramere being more slender and the curved appendix of the left narrower. *Length* (very variable in size) : 7·9–11·4 mm.

Distribution.—Japan : Kyushu. Pref. Nagasaki, Unzen, 3.ix.34 ♀ (*E. Suenson*). Pref. Fukuoka, Mt. Hiko, 10.x.49 ♀ (*A. Habu*, coll. Uéno). Shikok. Pref. Tokushima, Mt. Tsurugi, 1200 m., 4.viii.53, 2 ♂ (*M. Uozumi*, coll. Uéno). Pref. Ehime, Joju, Mt. Ishizuchi, 1300 m., 27.vii.51, 3 ♀ (*M. Miyatake*, coll. Uéno), Mt. Ishizuchi, 21.vii.52, ♂ (*K. Sasaki*, coll. Uéno). Honshu. Pref. Osaka, Takayama, Kiyotani-mura, 20.viii.46, ♂ (*S. Uéno*). Pref. Wakayama, Mt. Iwawaki, 24.vii.49, ♀ (*S. Uéno*). Pref. Nara, Mt. Ohdaigahara, Kimmeisui, 23.vii.53, ♂♀ (teneral) (*H. Ishida*, coll. Uéno). Pref. Yamanashi, Shoji 9–18.viii.26, 7 ex. (*E. Suenson*). Pref. Nagano, Mt. Ontake, Ohtakiguchi, 2000 m., 2.viii.53, ♀ (*S. Uéno*). Siberia : Vladivostok, ♀ (UMH). S. Manchuria. Chikuanshan, 5 ♂♀ (coll. J. Breit, MGF). Korea (*loc. class.*) : Kongosan, S. Gensan, 10.x.29, ♂ (*E. Suenson*).

23. *Synuchus orbicollis* Morawitz.

Calathus orbicollis Morawitz, 1862 : 204; 1863*a* : 248.
Calathus cycloderus Heyden, 1886 : 207.

The identification is clear from Morawitz' description as well as from the remarks on the type specimen made by Tschitschérine (1895 : 181). Heyden changed the name because of *Calathus orbicollis* Motschulsky, 1864, but the name proposed by Morawitz is valid and, in any case, " *cycloderus* " is preoccupied in *Synuchus* by Bates, 1873*a*. The present species was ranged under *Eucalathus* by Jacobson (1906 : 324) and, with doubt, under *Paradolichus* by Jedlička (1953 : 110).

Easily recognised by the prothorax (fig. 15G) which is very broad and convex, more narrowed forwards than towards base, with greatest width often decidedly behind the middle ; basal foveae very deep, linear, separated from the side-margin by a broad convexity which almost reaches the hind margin ; lateral deplanation along side margin narrow and ill-defined. Shoulders more produced and angulate than in the two preceding species. Elytra strongly iridescent owing to the very dense microsculpture (even denser than in *agonus*), consisting of transverse lines with only a slight tendency to form very transverse meshes. Femora and antennae (towards apex) sometimes slightly darkened. Hind wings usually reduced to an extremely small, rectangular rudiment but I have seen three fully winged males (from Vladivostok, Manchuria, and Shensi). Aedeagus, fig. 16G. *Length :* 8·3–10·7 mm.

Distribution.—Japan : Kyushu. Pref. Ohita, Beppu, 25.iv.15, ♂ (teneral, brachypterous) (*J. E. A. Lewis*, coll. Uéno). Honshu. Pref. Nagano, Azusagawa, near Shimauchi, 16.vi.52, ♂ (brachypterous) (*S. Uéno*). Siberia : Ussuri (*loc. class.*) ; Suyfun (Heyden, *l.c.*) ; Vladivostok, ♂ (*I. Bryner*, MNW). Manchuria: Mukden, 24.ix.22, 6 ex., 22.vi. (slightly teneral), 24.viii, 12 ex. 23 (*E. Suenson*) ; Gaolinzsy, 2.viii.40, ♂ (macropterous) (*W. Alin*, DEI). China : Prov. Shensi, Tsinlingshan Mts.: Hopingtse 11–1200 m., 12–16.vi., 67 ex. (several teneral), 13–15.vii., 32 ex. (none teneral) 1936 ; Chungshantse 17–18.vi.36, 16 ex. (several slightly teneral) (*U. G. Dong*, coll. Suenson). " Chovsan " (? position) (*Bowring*, BMNH). Korea : Shuotu, 21.vii.39,

2 ex. (*Y. Yano*, coll. Uéno); Chipo-ri SSE Chorwon, 19.x.53 (*T. J. Cohn*, MCZ); Kongosan, S. Gensan, 11.x.29 (*E. Suenson*); Quelpart Island, ♀ (brachypterous) (BMNH).

24. *Synuchus sikkimensis* Andrewes.

Calathus sikkimensis Andrewes, 1934 : 213.

Described here according to Andrewes (*l.c.*) and from the single female holotype (BMNH).

Antennae with the four basal segments paler than the remainder; this colour contrast between segments 4 and 5 being apparently unique within the group (cf. *picticornis*). Differs from *pallipes*, the only representative of the group from the same region, by the clearly defined raised lateral margin of prothorax, which is larger (in proportion to head and elytra), with evenly rounded sides and deeper basal foveae, which do not extend to middle of prothorax; hind angles completely rounded, the setigerous puncture well removed from side-margin. Microsculpture of prothorax denser and weaker than in *pallipes*, otherwise similar; consisting on elytra of very transverse (about three times as wide as long) meshes. Hind wings completely reduced. *Length :* 8·5 mm.

Distribution.—India : Sikkim, Gopaldhara, ♀ holotype.

The following two species, from China, are rather isolated within the group as well as *inter se*. They show a notably strong development of the microsculpture, which is isodiametric on the elytra.

25. **Synuchus limbalis** sp. n.

Very characteristic by reason of the isodiametric microsculpture which, along sides of prothorax and on apex of elytra, is so strong that the meshes are transformed into actual granulae. Slender, with notably long and parallel-sided elytra. Semiopaque, disc of prothorax a little more shining, sides of prothorax and of elytra completely dull. Dark piceous, margins of prothorax and elytra (including suture) reddish, mouthparts, antennae and legs reddish-yellow. Terminal segment of labial palps very slightly enlarged (less than in *crocatus* (fig. 14B)). Prothorax (fig. 15H) with front angles protruding and hind angles barely suggested; sides narrowly depressed in their entire length, basal foveae shallow but prolonged forwards to middle of disc. Shoulders protruding, forming almost a right angle, apex of elytra acuminate, without lateral sinuation, the intervals, especially the inner ones, convex. Internal furrow of hind tarsi very shallow. Hind wings fully developed and strong. Penis (fig. 16H) somewhat deformed owing to the slightly immature condition of the specimen. *Length :* 10·2 mm.

Distribution.—China : Prov. Kiangsu, mountains S. Chinkiang, 20.v.24, single ♂ holotype (*E. Suenson*).

26. **Synuchus calathinus** sp. n.

The depressed, narrow body and slender legs give this species a *Calathus*-like appearance. Distinguished by its strong, isodiametric microsculpture (well developed also on disc of prothorax), which gives the entire upper surface a semiopaque lustre. Black or deep piceous, margins of prothorax, sometimes also of the elytra (including the suture) brownish, mouth-parts, antennae and legs bright reddish-yellow. Terminal segment of labial palps hardly enlarged, almost fusiform. Prothorax (fig. 15I) not, or only slightly transverse, front angles little protruding, hind-angles suggested, the lateral depression not reaching the front-angles, basal foveae deep but ill-defined laterally, arcuately prolonged forwards on the disc. Shoulders strongly produced but rounded at tip, side-margin of elytra with

a very faint subapical sinuation, all intervals moderately convex. Hind tarsi evidently furrowed on both sides. Hind wings reduced to an almost inconspicuous rudiment. Aedeagus, fig. 16I. *Length:* 8·7–9·3 mm.

Distribution.—China: Prov. Chekiang, Tienmushan, on forest ground, 17.v., ♀ allotype and ♂ paratype (teneral), 4.vi., ♂ holotype, 1937; Mokanshan (N.W. Hangchow), 29–30.ix., 3 ♂ paratypes, 5.x., ♂♀ paratypes, 1926 (*E. Suenson*).

The following three species, all from Japan, are reminiscent of the *longipes* group, by reason of their small size and comparatively narrow, basally constricted prothorax (greatest width before middle). However, their eyes are larger, more convex, the hind angles of the prothorax are completely rounded and the base is less arcuate inside the posterior setigerous puncture. The hind wings are always greatly reduced.

27. **Synuchus montanus** sp. n.

Piceous black, the elytra clearly iridescent, margins of prothorax and elytra (including suture) more or less brownish, mouth-parts, antennae and legs reddish, femora sometimes slightly darkened. Labial palps with slightly enlarged terminal segment. Head broad with protruding eyes. Prothorax (fig. 15J) clearly constricted basally, with slightly prominent front-angles and barely suggested, completely rounded hind-angles; the sides evidently depressed along basal half of side-margin, basal foveae shallow and ill-defined but separated from side-margin by a slight convexity, at least in their frontal part. Basal margin of elytra strongly arcuate, the humeral angle evident though clearly obtuse; striae deep and the intervals decidedly convex. Hind tarsi furrowed on both sides, but less distinctly internally. Microsculpture well developed on entire upper surface, consisting on disc of the prothorax of slightly transverse meshes, and on elytra of dense transverse lines, forming strongly transverse meshes (more than three times as wide as long). Distinguished from *agonus*, which has a similar elytral microsculpture, by the narrower prothorax, with less depressed sides (especially in the frontal half), more defined basal foveae and the basal setigerous puncture, which is situated close to the side-margin. Aedeagus (fig. 16J) characterized by the truncate right paramere, which is less angulate than in any other species of *Synuchus*. *Length:* 7·9–9·7 mm.

Distribution.—Japan: Shikoku. Pref. Tokushima, Mt. Tsurugi 1200 m., 4.viii.53, 2 ♀ paratypes (*M. Uozumi*, coll. Uéno). Honshu, Pref. Nara, Mt. Ohdaigahara, Kimmeisui, 21.vii.53, ♀ paratype (slightly teneral) (*H. Ishida*, coll. Uéno). Pref. Kyoto, Kibune, 24.x.48, ♀ paratype (*S. Uéno*). Pref. Nagano, Kamikôchi 1550 m., 31.vii.53, ♂ holotype, ♀ allotype, 2 ♂ paratypes (*S. Uéno*); Mt. Ontake, Ohtakiguchi 2000 m., 2.viii.53, ♀ paratype (*S. Uéno*); Mt. Yaké, 21.viii.49, ♀ paratype (*K. Simizu*, coll. Uéno). Pref. Gumma, Hatomachi-tôge, Oze, 5.ix.52, ♀ paratype (*H. Hasegawa*, coll. Uéno).

28. **Synuchus narae** sp. n.

Very closely related to *montanus* and differing only in the following points: Head and prothorax larger, basal segment of antennae slightly thicker. Legs (especially hind-femora) longer, brighter red. Convexity of prothorax reaches nearer to reflexed side-margin, deplanation along sides of basal half narrower, basal foveae deeper, better defined laterally. Elytra with a still denser microsculpture and their iridescence therefore more pronounced. Had it not been for the male genitalia, I would not have ventured to describe this species: penis (fig. 16K) much less arcuate than in *montanus*, the right paramere "normal", not truncate, clearly angulate. *Length:* 9·0 mm.

Distribution.—Japan: Honshu, Pref. Nara, Mt. Ohdaigahara, Kimmeisui, 21.vii.53, ♂ holotype (*H. Ishida*, coll. Uéno). One ♀, same place and date, must be referred to *montanus* (*vide supra*).

29. Synuchus tristis sp. n.

Also closely related to *montanus*, but easily distinguished by the microsculpture of elytra, which is much coarser, the meshes being on an average only three times as wide as long; the elytra being therefore hardly iridescent. On disc of prothorax microsculpture meshes more evidently transverse than in the two preceding species. Also differs from *montanus* in the following characters: Antennae and hind-tarsi shorter, terminal segment of labial palps narrower fusiform, basal foveae of prothorax deeper, shoulders less produced, more rounded. Black or deep piceous, margins of prothorax and elytra slightly paler, mouth-parts, antennae and legs yellowish-brown. Normally, the antennae are more or less darkened from (and including) fourth segment (exceptionally from third) and also the femora, but a variety occurs with pale antennae and legs (*vide infra*). Penis (fig. 16L) more or less pigmented (blackish) in its central part, otherwise, like the parameres, almost identical with that of *narae*. *Length* (6·4–) 7·8–8·9 mm.

Distribution.—Japan: Honshu. Pref. Nara, Mt. Ohdaigahara 1000 m., 2.viii.53, ♂ paratype (*M. Iga*, coll. Uéno). Pref. Nagano, Kamikôchi 1550 m., 29.vii.53, ♂ holotype, ♀ allotype, 10 paratypes (*S. Uéno*). 9.vii.51, ♂ paratype (teneral) (*H. Ishida*, coll. Uéno); Mt. Ontake, Kurosawaguchi, 1600 m., 5.viii.53: 1600 m., ♂ paratype, 1700 m., ♀ paratype, 1800 m., 2 ♂ paratypes, 1900 m., 1 ♂, 3 ♀ paratypes, 2000 m., 4 ♂, 2 ♀ paratypes: 2500 m., 21.vii.53, ♂ paratype (*S. Uéno*): Mt. Ontake, Ohtakiguchi, 2000 m., 2.viii.53, 2 ♂, 3 ♀ paratypes (*S. Uéno*). Pref. Aomori, Karasuzawa, Yamagata-mura, 5.x.47, 2 ♂ paratypes (*K. Shimoyama*, coll. Uéno).

In E. Suenson's collection there are two males (one only 6·4 mm.) and five females, differing only in colour characters:

Ground-colour (in spite of the quite mature condition) more piceous, the antennae and legs uniformly yellowish-brown, penis with no dark pigmentation.

Locality Japan: Pref. Nagano, Kamikôchi, 14–19.ix.34, 4 ex., 11.ix.35, 3.vii. (teneral), 28.vii.39 (*E. Suenson*). These specimens were captured in a wood and possibly the "normal" dark form of the species is confined to higher altitudes.

The three American species of the genus have an almost circular prothorax, with completely obsolete hind angles. The microsculpture of the elytra is isodiametric. The hind tarsi have usually an evident external furrow but the internal one has disappeared or is only faintly suggested.

30. *Synuchus impunctatus* Say.

Feronia impunctata Say, 1823: 45–46.
Pristodactyla americana Dejean, 1828: 83: subsp. *convexa* Casey, 1913: 160.
Pristodactyla corvina Leconte, 1848: 217.

Say's description seems to leave little doubt as to the application on the present species. I have seen Dejean's male type of *americanus* (Lindroth, 1955*b*). Leconte's *corvinus* was sunk by himself (1860: 318) to a form of *impunctatus*; in *Synoptic Tables* (1883: 49) it was completely omitted but re-established as a variety or subspecies by Casey (1913: 160) and by Leng (1920: 62). The name

is superfluous, as is that of *convexus* Casey, of which I have seen the single female type (NMW).

Piceous black (underside paler), margins of prothorax and elytra a little rufescent, mouthparts, antennae (sometimes slightly darkened distad) and legs rufous. Labial palpi (fig. 14F) with almost cylindrical terminal segment. Prothorax (fig. 15K) with all angles completely rounded, widest before middle, basal foveae large but varying in form and depth, the raised basal margin (inside the setigerous puncture) ill-defined. Elytra with

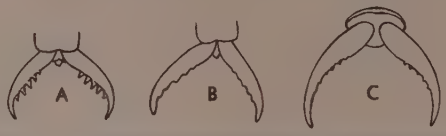

FIG. 17.—Hind-claws of: A, *Synuchus impunctatus* Say, immature specimen (Newfoundland, Badger, 25.vi.51); B, ditto, old specimen (Newfoundland, Millertown Jctn., 21.viii.49); C, *S. dubius* Lec. (U.S.A., New Mexico, Cloudcroft).

broadly rounded shoulders, the striae deep, with almost imperceptible rudiments of punctures. Microsculpture of elytra consists of irregularly isodiametric meshes, with a slight tendency to arrangement in transverse rows. Lateral furrow of posterior tarsi unusually variable (cf. Leconte, 1860: 317) from strong to almost absent; exceptionally, there is also a faint suggestion of an internal furrow. Claws always clearly serrate but size of teeth decreases with the age of the beetle (figs. 17A, B). Hind wings usually greatly reduced (less than half length of meso-tibia) but fully-winged individuals occur which may be capable of flight: one specimen taken at light in Washington, D.C., 25.vi.01 (*G. E. Burden*, NMW). Aedeagus, fig. 16M. *Length:* 8·7–11·1 mm.

Distribution.—NORTH AMERICA: Probably continuously distributed from Newfoundland (Lindroth, 1955*a*) to Washington (Hatch, 1953 : 132) and British Columbia (MCZ, NMW, DAO); south to Georgia ("*corvinus* Lec."). The record from Mexico (Bates, 1891*a*, : 252) refers to *semirufus* Casey.

Ecology.—From my experience in Newfoundland (Lindroth, 1955*a* : 116), this species is similar in its needs to *nivalis*. It prefers rather dry soil (usually sandy moraine) with moderately dense vegetation and little or no shade from trees; e.g. among dead leaves under *Rubus* and other bushes. The species is a very pronounced larval hibernator (fig. 39, p. 569); the imagines disappear completely before winter. A description of the first stage larva is given on page 561.

31. *Synuchus semirufus* Casey.

Pristodactyla semirufa Casey, 1913 : 161.
Pristodactyla impunctata Bates, 1891*a* : 252, nec Say.
? *Pristodactyla subopaca* Casey, 1920 : 223.

I have seen the single female types of both Casey species (NMW) but at that time made no close comparison between them. On the basis of a series of specimens ("*impunctatus*" Bates, 1891) from prov. Durango, Mexico (BMNH; coll. Bates, MNP), all more or less immature, I find, however, that the main features used by Casey for defining (without comparison!) his *semirufus* and *subopacus* (base and basal foveae of prothorax, punctuation of elytral striae, number and degree of impression of their dorsal punctures) are all variable;

the difference in colour is due to the fact that *semirufus* was described on an obviously immature specimen.

Smaller and slenderer than *impunctatus*, similarly coloured, except that, according to Casey's description of a mature specimen ("*subopacus*"), the legs may be darkened. Easily distinguished by the laterally well-defined basal margin of prothorax (fig. 15M) and the quite regular, isodiametric microsculpture of elytra. From *dubius* it can be distinguished by the smaller size, more produced front-angles of prothorax, and the evidently serrate claws (as in *impunctatus*). Basal foveae of prothorax usually narrower, more linear, than in *impunctatus* and more prolonged forwards. Rudiments of punctures in elytral striae usually more evident. Number of dorsal punctures varies from three to five (often asymmetrically): I have seen two specimens with three on the one and five on the other elytron. Hind wings apparently always reduced. Aedeagus, fig. 16N. *Length:* 8·7–9·8 mm.

Distribution.—MEXICO: Prov. Durango, Ciudad and Ventanas (Bates, *l.c.*; BMNH, MNP). Prov. Chihuahua, Sierra Madre Mts. (*loc. class.*). Morelos (probably the province S. of Mexico City), Tres Marias (*loc. class.* of *subopacus* Casey). The insect is apparently a mountain species.

32. *Synuchus dubius* Leconte.

Pristodactyla dubia Leconte, 1854 : 38.
Pristodactyla arizonica Casey, 1913 : 160; *P. zuniana* Casey, 1913 : 161; *P. neomexicana* Casey, 1920 : 221; *P. juabitica* Casey, 1924 : 87.

The unusual variability of this species (in size, lustre, and other details) induced Casey to describe the four "new species" above; but he had no specimen under *dubia* in his collection (NMW). The male types, or paratypes, of *arizonicus*, *zunianus* and *neomexicanus* were also investigated by means of genital slides, *juabiticus* (single female type) on external characters only. Casey used (1920 : 221) the differently developed serrulation of the tarsal claws as one of the distinguishing characters for two of his "species". There is no doubt that the claws become smoother by tearing during the adult life of the beetle (cf. fig. 17). It is possible, however, that a division of *dubius* into subspecies will become necessary when ample series are available from different localities. If so, at least some of Casey's names may then be restored.

Dark piceous to almost black, mouth-parts, antennae and legs more or less reddish (but never clear rufous as in *impunctatus*), femora usually darker. Entire upper surface usually (but not always) quite dull due to the strong absolutely isodiametric microsculpture on the elytra. Prothorax (fig. 15L) broad and convex, greatest width evidently before the middle, front-angles broadly rounded, raised basal margin more evident than in *semirufus*, basal foveae more or less linear, delimited laterally by a more or less pronounced convexity. Elytral striae very variable in depth, the punctures of the inner ones usually more evident than in the preceding two species, the intervals varying from absolutely flat to evidently convex; dorsal punctures 2 or 3 in number, often asymmetric. Lateral furrow of hind tarsi more or less pronounced. Denticles on inner side of claws (fig. 17C) always rudimentary but more or less so. Hind wings always greatly reduced. Penis (fig. 16O) fairly constant in form. *Length:* 10·2–13·2 mm.

Distribution.—NORTH AMERICA: United States. Utah, Juab Co. ("*juabiticus* Csy."). Colorado, e.g. La Plata Co. (MCZ). Arizona ("*arizonicus* Csy."). New Mexico (*loc. class.*), e.g. Cloudcroft ("*neomexicanus* Csy"; also in MCZ), S. Fé Cañon (NMW). It is apparently a mountain species.

In the following four species the lateral raised margin of the prothorax is less evident, with obscure inside limit. In the other members of the *impunctatus* group this limit is sharp and represented by an engraved line. The difference is best seen immediately in front of the basal setigerous puncture. The hind angles are always evident (though often rounded at the tip) and the sides in front of them straight or slightly sinuate.

33. *Synuchus pallipes* Andrewes.

Calathus pallipes Andrewes, 1934 : 213.

The holotype and several paratypes were studied (BMNH).

Piceous black, prothorax slightly brownish, especially along the margins; mouth-parts, antennae and legs flavous. Head rather narrow with only slightly protruding eyes. Prothorax (fig. 15N) flat, small and narrow, widest a little before middle, the sides straight or slightly sinuate behind, the base arcuate inside the hind angles which are evident though obtuse and rounded, front angles prominent; the sides narrowly reflexed, broader basally, but this reflexion not sharply delimited inwards in its basal part; basal foveae broad and flat, prolonged forwards to the middle of the disc, basal setigerous puncture situated so close to side-margin that it produces a micro-sinuation in front of the hind-angles. Elytra widest behind the middle, with almost rounded shoulders, intervals (at least the median ones) slightly convex. Microsculpture isodiametric on the head, on disc of prothorax it consists of transverse meshes, on the elytra of irregular, in part slightly transverse, in part more or less isodiametric meshes with tendency to arrangement in transverse rows. Hind wings fully developed. Aedeagus, fig. 16P. *Length :* 7·6–9 mm.

Distribution.—India : United Provinces. The districts of West Almora, Ranikhet and Chakrata, up to 2000 m. (Andrewes, *l.c.*).

34. **Synuchus minimus** sp. n.

The smallest species of the whole genus. Closely related to *pallipes* but differing in the following points : Eyes smaller, with larger and more convex facets, neck less constricted. Prothorax (fig. 15O) narrower (in proportion to the elytra), more convex, with a tubercle in the basal foveae, which are less prolonged forwards. Elytra more convex, more dilated apically, the basal margin more arcuate, especially the median part, shoulders more angulate though very obtuse, apex more rounded, scutellar stria shorter. No difference in microsculpture. Hind wings completely reduced. *Length :* 6·2 mm.

Distribution.—Formosa : Tappan, near Mt. Ari, 8.vi.38, single ♀ holotype (*Y. Yano*, BMNH).

35. **Synuchus laticollis** sp. n.

Closely allied to *suensoni* but easily distinguished by the microsculpture of elytra which consists of irregular, slightly to evidently transverse meshes, with a tendency to arrangement in transverse rows (in the female the microsculpture is denser, otherwise similar). Microsculpture (transverse meshes) stronger on disc of prothorax than in *suensoni*. Prothorax (fig. 15P) broader in proportion to elytra, its front-angles a little more prominent. Elytra narrower, especially over the shoulders, more dilated towards apex, the striae deeper, the intervals more convex. Hind wings completely reduced. Aedeagus, fig. 16Q. *Length :* 7·0–7·3 mm.

Distribution.—Formosa : Kouden, near Kagi, 28.iv.41, ♂ holotype (*Y. Yano*, coll. Uéno). Kodama, near Arisan, 3.vii.38, ♀ allotype (*Y. Yano*, BMNH). Mt. Daitonzan, 9.vi.41 ♀ paratype (*Y. Yano*, coll. Uéno).

36. **Synuchus suensoni** sp. n.

Colour as in *pallipes*, but usually paler, piceous in ground-colour, all appendages brownish-yellow. More convex throughout. Eyes more prominent. Prothorax (fig. 15Q) much broader, hind angles more rounded, sides straight or slightly rounded in basal half, basal foveae deeper, better defined. Elytra less dilated apically, with strongly arcuate basal margin (especially laterally), shoulders prominent, almost right-angled, striae deeper with more convex intervals. Microsculpture almost obliterated on disc of prothorax which is, therefore, more shining ; strong on elytra and consisting of regularly isodiametric meshes. Hind wings fully developed. Aedeagus, fig. 16R. *Length :* 7·0–8·3 mm.

Distribution.—China : Prov. Fukien, Buong Kä, N. Foochow, 28–29.iv.35, ♂ holotype, ♀ allotype and 24 paratypes (many more or less teneral) (*E. Suenson*); Kuatun, 1930, ♀ paratype (*J. Klapperich*, MNP), 2300 m., 18.iv.38, 4 paratypes (all teneral) (*J. Klapperich*). Prov. Chekiang, Hangchow, 23.iv.21, ♂♀ paratypes (teneral) ; Chekiang 27.iv.20, ♂ paratype (teneral), 4.vi.20, ♂ paratype (*E. Suenson*). Prov. Hupeh, Mts. Wushan, 2 ♂ partypes (coll. G. Hauser, BMNH).

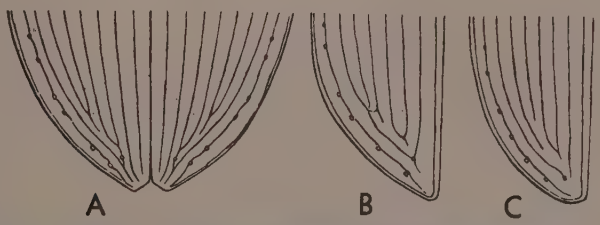

Fig. 18.—Apex of elytra : A, *Synuchus dulcigradus* Bts. (Japan, Kyoto) ; B, *S. longipes* sp. n., allotype (Japan, Nara) ; C, *S. patroboides* sp. n., holotype (Japan, Fuji).

The *nikkoensis* Group.

(*Trephionus* Bates, 1883 : 255, type *nikkoensis* Bts.; *Kirishimanus* Habu, 1954*a* : 270, type *takakurai* Habu)

The members of this group, all Japanese and in general facies resembling the genus *Patrobus*, are at once recognised by the completely smooth tarsal claws (fig. 19A) and the lack of dorsal punctures on the third interval of the elytra (but the preapical puncture at the tip of the second stria is present.)

Prothorax (figs. 20, 21A–C) narrow, usually with the sides sinuate in the basal half. Eyes notably small, at least one of the species being cavernicolous, and probably all have a more or less pronounced subterranean mode of living. Hind wings always rudimentary.

The subgenus *Kirishimanus* Habu (1954*a* : 270), established on the single character of internally smooth hind-tarsi, is quite superfluous. The detailed diagnoses by Habu (1954) and Uéno (1955*a*) of the seven species belonging here makes only a short description necessary.[5] Uéno (1955*a*) has published photographs of all seven species.

[5] The species described by Habu (1944) as *Trephionus otuboi*, belongs in the *Agoni*. It was later (Habu, 1954 : 263–269) made the type species of the new genus *Morimotoidius* Habu.

37. *Synuchus nikkoensis* Bates.

Trephionus nikkoensis Bates, 1883 : 255.

Typical specimens were studied at the BMNH.

Dark piceous, mouth-parts, antennae and legs reddish. Head narrow, with small, only slightly prominent eyes and broad neck. Prothorax (fig. 21A) strongly narrowed behind and sinuate before the obtuse, rounded hind-angles ; the base arcuate laterally, basal foveae rather deep, separated from side-margin by a convexity. Elytra oviform, with narrow shoulders, moderately arcuate basal margin and strongly obtuse humeral angle ; striae deep, the intervals rather convex throughout. Microsculpture strong : consisting on disc of prothorax and on elytra of meshes about twice as wide as long, on the latter arranged in irregular transverse rows. Terminal segment of labial palps slender, fusiform. Aedeagus, figs. 22A, B. *Length :* 7·7–9·2 mm. Habu (1954) gives a nice habitus drawing of *nikkoensis f. typ.*

Distribution.—Japan : Honshu. Pref. Nagano, Kamikôchi, 14–20.ix.34, 3 ex., 9–10.ix.35, 2 ex., 31.vii.39, 1 ex. (teneral) (*E. Suenson*), 1550 m., 29.vii.53, 1 ex. (teneral) (*A. Nakahira*, coll. Uéno). Prov. Tochigi, Nikko and Nantaizan (*loc. class.* BMNH). Pref. Fukushima (Habu, 1954 : 272).

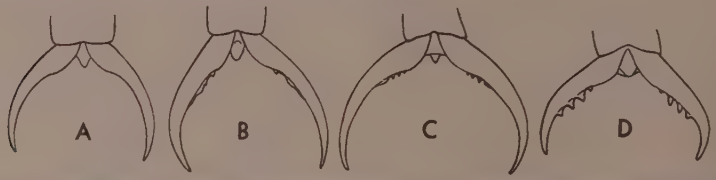

Fig. 19.—Hind-claws of : A, *Synuchus nikkoensis* Bts., paratype (Japan, Nikko) ; B, *S. patroboides* sp. n., holotype (Japan, Fuji) ; C, *S. longipes* sp. n., allotype (Japan, Nara) ; D, *S. ventricosus* sp. n., holotype (Japan, Nara).

Synuchus nikkoensis kinoshitai Habu.

Synuchus kinoshitai Habu, 1954*a* : 272–274 (with good habitus drawing).

This was described as a separate species. I investigated two males and one female from Mt. Ontake, sent by Mr. Uéno after comparison with Habu's single female type, and I am unable to find other differences than in the prothorax, which is slightly wider in *kinoshitai*, with the sides more rounded in the frontal and more sinuate in the basal half. This is, however, more pronounced in the specimen figured (fig. 21B) than in the other two. The microsculpture is identical. The penis form, mentioned by Uéno (1955*a* : 41), is not quite constant : in one of the *kinoshitai* males it agrees completely with that of a true *nikkoensis* from Kamikôchi ; no difference in the parameres was observed (fig. 22C). *Length :* 8·2–9·5 mm.

Distribution.—Japan : Honshu. Pref. Nagano, Mt. Ôrenge (*loc. class.*) ; Mt. Ontake, Kurosawaguchi, 1800 m., 5.viii.53, 2 ♂, 1 ♀ (*S. Uéno*).

Synuchus nikkoensis subcavicola Uéno.

Synuchus subcavicola Uéno, 1955*a* : 41 (with habitus photograph).

This was also described as a separate species but at the same time the author mentioned its very close relationship to *nikkoensis* : "the only important differ-

ences which eliminate it from the latter species seem to be those found in the microsculpture on the elytra and in the structure of the aedeagus". I have now seen two females from Mt. Fuji (*Darlington*); one of these and a female paratype of *subcavicola*, sent by Mr. Uéno, are externally identical but in the microsculpture of the elytra the two Mt. Fuji specimens are intermediate between *nikkoensis* s. str. and *subcavicola*, i.e. the lines form distinct, transverse meshes which are broader and more irregular than in *nikkoensis*, but not as dense as in *subcavicola* (likewise in the latter the meshes are distinct, though irregular in form). Prothorax, fig. 21C. The penis (fig. 22D), as mentioned above under subsp. *kinoshitai*, is more variable in the true *nikkoensis* than Uéno believed it to be, but it must be admitted that the slight emargination of the apex in *subcavicola*, if constant (Uéno, *l.c.*, fig. 1) is an important difference. The true position of *subcavicola* cannot be decided until more material is available. *Length :* 8·6–9·4 mm.

Distribution.—Japan : Honshu. Pref. Nagano, in two caves at Hirogawara, 26.x.52 (*loc. class.*). ? Pref. Shisuoka, sides of Mt. Fuji, x.45, 2 ♀ (*P. J. Darlington*, MCZ); intergrade to *nikkoensis* s. str. Uéno (*l.c.*) regards *subcavicola* as troglophilous, rather than troglobiotic.

38. *Synuchus takakurai* Habu.

Trephionus takakurai Habu, 1954*a* : 274–276 (with habitus drawing).

Habu's long description gives very little information ; it was supplemented by Uéno (1955*a*).

A remarkably narrow species, unpigmented, reddish-brown, with flat and slightly reduced eyes. Prothorax, fig. 20A. Microsculpture of elytra isodiametric. Penis, according to the imperfect drawing by the author (*l.c.* : 278), very similar to that of *obscurus* Uéno, but the drawing gives the impression of having been made from a somewhat immature specimen. *Length :* 7·9 mm. (Uéno, 1955*a*.)

Distribution.—Japan : Kyushu. Pref. Kagoshima, Kirishima Mts., 24.v.46, single ♂ type.

39. *Synuchus obscurus* Uéno.

Trephionus obscurus Uéno, 1955*a* : 43, Pl. I, *e*.

The author kindly sent the female allotype for study. The species is very closely allied to *takakurai* and possibly a large subspecies only. This cannot be decided until more material is available and, in the absence of any specimen of *takakurai*, I follow Uéno who regards them as distinct.

Dark brown, elytra slightly dull due to strong, isodiametric microsculpture. Eyes flat but their diameter more than twice as long as the distance to the point of insertion of the antennae. Prothorax, fig. 20B. Aedeagus, fig. 22E. *Length :* 9·4–10·5 mm.

Distribution.—Japan : Kyushu. Yakushima Island, Hananoégo, 1600 m., 17.vii.36, ♂♀.

40. *Synuchus sordidatus* Habu.

Trephionus sordidatus Habu, 1954*a* : 276–279.

Habu gives a nice habitus drawing and Uéno (1955*a*, Pl. I, *a*) a photograph. Mr. Uéno sent a female (Mt. Kajigamori) which he had compared with the type.

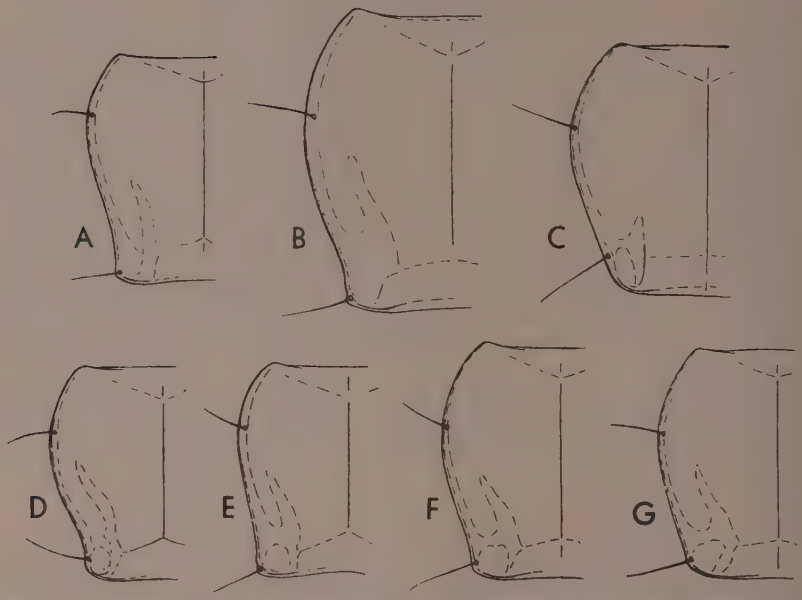

Fig. 20.—Prothorax of: A, *S. takakurai* Habu, holotype (redrawn after Habu, 1954); B, *S. obscurus* Uéno, allotype (Japan, Yakushima); C, *S. sordidatus* Habu (Japan, Kagoshima); D, *S. kurosai* Uéno, paratype (Japan, Ehimé); E, *S. microphthalmus* Uéno (Japan, Nara); F, *S. igai* Uéno, f. typ., holotype (Japan, Kôchi); G, *S. igai amplicollis* Uéno, holotype (Japan, Kôchi).

Easily distinguished from all other members of the group by the completely rounded hind angles of prothorax, from which the basal setigerous puncture is widely removed (fig. 20C). Eyes normal, rather convex. Microsculpture of elytra consists of very dense transverse lines (partly fusing to irregular, very wide meshes) which cause a slight iridescence. Penis, according to drawing by Habu (*l.c.* : 278), very similar to that of *nikkoensis*. *Length :* 9·0–9·8 mm.

Distribution.—Japan: Kyushu. Pref. Miyazaki, Shiiba, 23.ix.50, ♀ allotype (*Habu, l.c.*). Shikoku, Pref. Kôchi. Tsuchigoya, 10.vii.52, ♂ holotype (*Habu, l.c.*); Mt. Kajigamori 1200 m., 21.vii.52, ♀ (*M. Iga*, coll. Uéno).

41. *Synuchus kurosai* Uéno.

Trephionus kurosai Uéno, 1955*a* : 44, fig. 5, Pl. I, *g*.

Mr. Uéno sent a female paratype for study.

Reddish-brown, eyes reduced as described in the key. Prothorax (fig. 20D) constricted towards base (though, according to Uéno's drawing, not always as much as in the specimen here figured). Elytra with deep striae and convex interstices (especially at base), their microsculpture very coarse, consisting of meshes about twice as wide as long (as in normal *nikkoensis*). This and the following two species, as pointed out by Uéno (1955*a* : 40), are distinguished by the peculiar structure of the seventh elytral stria which joins striae 1 and 2 at apex instead of ending blind. Aedeagus, fig. 22F. *Length :* 7·0–8·4 mm.

Distribution.—JAPAN: Shikoku, Pref. Ehimé, Mt. Ishizuchi, 19.ix.48, 1 ♂, 6 ♀ (*Uéno, l.c.*).

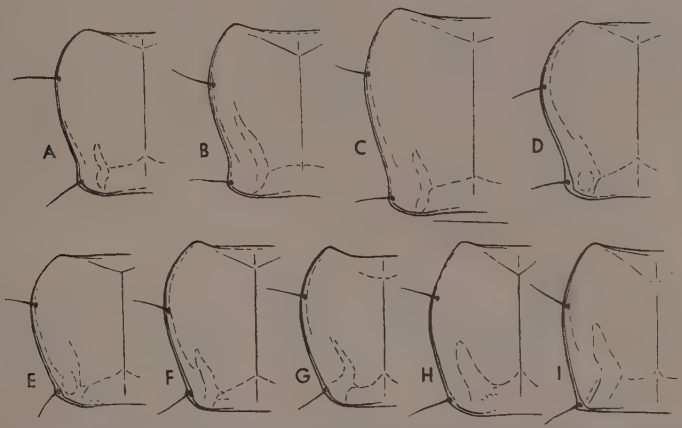

FIG. 21.—Prothorax of: A, *Synuchus nikkoensis* Bts., *f. typ.*, paratype (Japan. Nikko); B, *S. nikkoensis kinoshitai* Habu (Japan, Nagano); C, *S. nikkoensis subcavicola* Uéno, paratype (Japan, Nagano) (slightly greater magnification); D, *S. longipes* sp. n., holotype (Japan, Nara); E, *S. patroboides* sp. n., holotype (Japan, Fuji); F, *S. ventricosus* sp. n., holotype (Japan, Nara); G, *S. picticornis* sp. n., holotype (Japan, Gumma); H, *S. darlingtoni* sp. n., paratype (Japan, Fuji); I, *S. rectangulus* sp. n., holotype (Formosa).

42. *Synuchus microphthalmus* Uéno.

Trephionus microphthalmus Uéno, 1955*a*: 47, Pl. I, *j*.

Mr. Uéno sent one of the two specimens (the male) mentioned in his description as differing slightly from the holotype.

Reddish-brown, eyes reduced as in *kurosai*. Terminal segment of labial palps broader fusiform (greatest width in the middle) than in the other species of the group, except *igai*. Prothorax (fig. 20E) almost square, the base only slightly arcuate laterally. Elytra with isodiametric microsculpture. All tarsi slightly concave at middle, basal segments of hind tarsi furrowed on both sides. Aedeagus, fig. 22G. *Length:* 7·7 mm.

Distribution.—JAPAN: Honshu, Pref. Wakayama, Ohnuma-Jinja, 24.x.51, ♂ holotype. Pref. Nara, Mt. Ohdaigahara, 30.vii.52, ♂♀, slightly deviating from the type (*Uéno, l.c.*).

43. *Synuchus igai* Uéno.

Trephionus igai Uéno, 1955*a*: 46, Pl. I, *h*.

Mr. Uéno kindly sent the holotype for study.

Differs from all other Synuchi in pubescence of antennae, which commences on the apical half of the third segment (as in subgen. *Europhilus* of *Agonum*). Otherwise very similar to *kurosai* and mainly distinguished as follows: Eyes larger, their diameter almost twice as long as the distance to the antennae. Labial palpi as in *microphthalmus*. Prothorax, fig. 20F. Microsculpture of elytra as in *kurosai*. *Length:* 8·5 mm.

Distribution.—JAPAN: Shikoku, Pref. Kôchi, Mt. Kajigamori, 21.vii.52, single ♀ holotype.

Synuchus igai amplicollis Uéno.

Trephionus igai amplicollis Uéno, 1955*a* : 47, Pl. I, *i*.

Mr. Uéno kindly sent the holotype.

Distinguished from true *igai* mainly in the form of prothorax (fig. 20G). Microsculpture of elytra denser, more irregular, the meshes narrower, in places many times as wide as long. *Length :* 8·1 mm.

Distribution.—Japan : Shikoku. Pref. Kôchi, Erimon, Hong awa murra, 18.vi.52, single ♀ holotype.

The *longipes* Group.

In general appearance so similar to the *nikkoensis* group that, if the latter is treated as a genus (*Trephionus*), the present species must be included. The transition is formed by two species (*longipes*, *patroboides*) in which the teeth of the tarsal claws are rudimentary (figs. 19B, C). Two dorsal punctures are, however, always present on third interstice of elytra. Eyes, though small, not rudimentary but more or less convex. Hind wings constantly reduced. Japan.

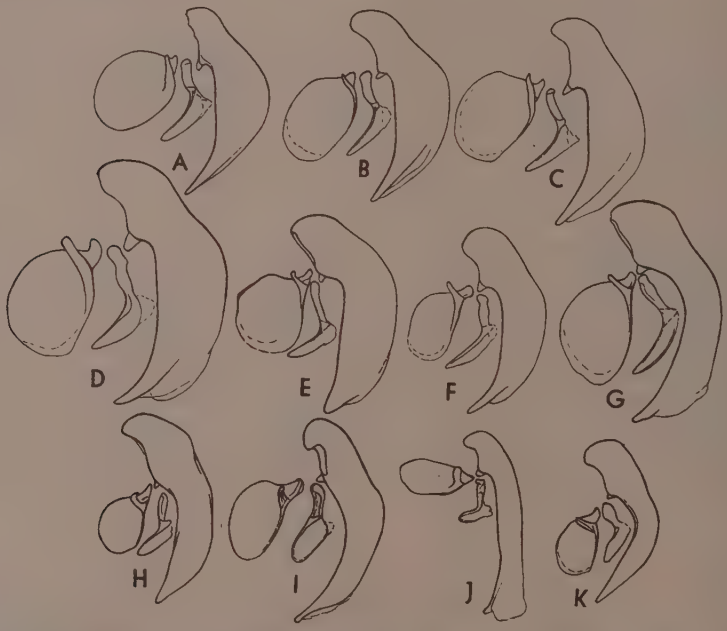

Fig. 22.—Aedeagus of : A, *Synuchus nikkoensis* Bts., f. typ., paratype (Japan, Nikko) ; B, ditto (Japan, Nagano, Kamikôchi) ; C, *S. nikkoensis kinoshitai* Habu (Japan, Nagano) ; D, *S. nikkoensis s ubcavicola* Uéno, holotype (redrawn after Uéno, 1955*a*) ; E, *S. obscurus* Uéno (ditto) ; F, *S. kurosai* Uéno (ditto) ; G, *S. microphthalmus* Uéno (ditto) ; H, *S. longipes* sp. n.. holotype (immature) (Japan, Nara) ; I, *S. patroboides* sp. n., holotype (Japan, Fuji) ; J, *S. darlingtoni* sp. n., paratype (Japan, Fuji) ; K, *S. rectangulus* sp. n., paratype (Formosa).

44. **Synuchus longipes** sp. n.

Generally similar to *nikkoensis* but with rudiments of teeth on the claws (fig. 19C) and two dorsal punctures on third elytral interval. Prothorax (fig. 21D) a little shorter than in *nikkoensis* and with less sinuate sides. Elytra much flatter (side view), acuminate at apex (fig. 18B), the intervals more convex (especially basally), the basal margin less arcuate, the shoulders completely rounded. Legs, especially hind femora, longer and slenderer. Microsculpture of elytra denser, its meshes several times as wide as long, thus forming a rather regular system of transverse lines. Aedeagus, fig. 22H. *Length :* 9·1–9·3 mm.

Distribution.—Japan : Honshu. Pref. Nara, Mt. Ohdaigahara, Kimmeisui, 21–23.vii.53, ♂ holotype (immature), ♀ allotype (*H. Ishida*, coll. Uéno).

45. **Synuchus patroboides** sp. n.

Piceous, front part of head, margins of prothorax and elytra (including the suture) reddish, mouth-parts, antennae and legs yellow. Less convex than *nikkoensis*, antennae and legs shorter (still more so in comparison with *longipes*). Prothorax (fig. 21E) shorter, more narrowed basally, sides less sinuate behind, hind angles denticulate, basal margin less arcuate. Basal margin of elytra almost straight, shoulders not angulate, apex broadly rounded (fig. 18C). Claws with rudiments of teeth (fig. 19B). Microsculpture of elytra denser and finer than in any other species of the group, the elytra therefore slightly iridescent. Aedeagus, fig. 22I. *Length :* 8·0 mm.

Distribution.—Japan : Honshu. Pref. Yamanashi, Shoji, about 1000 m., 10.viii. 26, ♂ holotype (*E. Suenson*).

46. **Synuchus ventricosus** sp. n.

Piceous black, prothorax and suture of elytra brown (perhaps individually only), mouth-parts, antennae and legs reddish-yellow. Frontal furrows deep, limited laterally by a ridge, eyes larger and more prominent than in *nikkoensis*. Prothorax (fig. 21F) very convex, otherwise similar to that of *patroboides*, hind angles likewise denticulate but the side-margin barely sinuate and the basal margin more arcuate laterally (almost as in *nikkoensis*). Elytra convex, oviform, greatest width evidently behind the middle, basal margin slightly arcuate, shoulders completely rounded, striae and intervals as in *nikkoensis*. Claws (fig. 19D) with well-developed teeth. Microsculpture of elytra almost as dense as in *patroboides*, which causes a very slight iridescence. *Length :* 8·3 mm.

Distribution.—Japan : Honshu Pref. Nara, Mt. Ohdaigahara, Kimmeisui, 21.vii.53, ♀ holotype (*H. Ishida*, coll. Uéno).

47. **Synuchus picticornis** sp. n.

Generally similar to *ventricosus* but at once distinguished from this and from all other *Synuchus* (except perhaps *sikkimensis*) by the dark, piceous segments 3–4 of the antennae. Smaller than *ventricosus*, with narrower head and shallower, laterally not sharply delimited frontal foveae. Prothorax (fig. 21G) also narrower, less enlarged forwards. Hind angles very obtuse, almost obsolete, the sinuation in front almost absent. Elytra with slightly more produced shoulders, otherwise similar ; their microsculpture strong and open, as in *nikkoensis*. *Length :* 7·3–7·8 mm.

Distribution.—Japan : Honshu. Pref. Gumma, Hatomachi-tôgé, Oze, 5.ix.52, ♀ holotype (*H. Hasegawa*, coll. Uéno) ; Nebazawa, 8.ix., Shirô-tôgé, 9.ix.37, 2 ♀ paratypes (*Y. Yano*, BMNH).

48. **Synuchus darlingtoni** sp. n.

Very slender, especially the prothorax, antennae (see key) and legs (especially the tarsi) notably long. Piceous black, prothorax (at least along its margins), side-border and suture of elytra brown, mouth-parts, antennae and legs reddish-yellow. Head narrow, with small, rather flat eyes, as in *nikkoensis*. Prothorax (fig. 21H) narrower than in the related species, hind angles very obtuse but evident, their sides straight or faintly sinuate in front, basal margin moderately arcuate. Elytra oblong-oval, greatest width about middle, basal margin more arcuate than in the other members of the group, shoulders angulate though obtuse. Microsculpture of prothorax less distinct than in the related species, on the elytra resembling that of *ventricosus*, producing a very faint iridescent lustre. Palpi, fig. 14G. Aedeagus, fig. 22J. *Length :* 7·3–8·8 mm.

Distribution.—Japan : Honshu. Pref. Shisuoka, south-side of Mt. Fuji, more than 1000 m., x.45, ♂ holotype, ♀ allotype, 8 paratypes (*Darlington*, MCZ).

The following species, from Formosa, takes an isolated position but seems to be most closely related to the *longipes* group. It differs in its peculiarly square prothorax, with straight base, the broad head and the slightly dilated terminal segment of the labial palpi. To some degree it represents an equivalent of *microphthalmus* within the *nikkoensis*-group.

49. **Synuchus rectangulus** sp. n.

Piceous brown, all margins of prothorax and elytra (including the suture) paler. Head larger, with more prominent eyes than in the other species of this and the preceding group. Prothorax (fig. 21I) almost quadrate, with only slightly prominent front angles and sharply rectangular hind angles, depressed along side-margin, basal foveae large, ill-defined, prolonged forwards (in the holotype with an oblique tubercle, lacking in the paratype). Elytra with broad base, only slightly rounded sides, widest behind middle ; basal margin almost straight, shoulders angulate though obtuse, striae moderately deep, intervals slightly convex. Microsculpture of prothorax unusually strong and consisting of irregular, almost isodiametric meshes ; on the elytra as in *nikkoensis*. Labial palpi with a slightly dilated terminal segment (fig. 14H). Claws evidently serrate. Hind wings completely reduced. Aedeagus, fig. 22K. *Length :* 7·6–7·7 mm.

Distribution.—Formosa : Jujiro, near Mt. Ari, 8.vi.38, ♂ holotype (*Y. Yano*, coll. Uéno) ; Mt. Daitonzan, 10.vi.41, ♂ paratype (*Y. Yano*, coll. Uéno).

The *cathaicus* group (*Semenovia* Jedlička, 1953).

Prothorax (figs. 23C, D) decidedly transverse with well-defined hind angles and broadly rounded front angles. Eyes very prominent. Palpi not dilated, terminal segment of labial palpi almost cylindrical. Shoulders broadly rounded. Protarsi of male only slightly dilated.

50. *Synuchus cathaicus* Bates.

Pristodactyla cathaica Bates, 1873*b* : 330.
Calathus coptopsophus Putzeys, 1873 : 81.

I have seen authentic secimens of *cathaicus* from Foochow (BMNH). I investigated a male of *coptopsophus* at the MNP (" Chine boréale, Stevens "; coll. Oberthür, " Ex Musaeo Chaudoir "), no doubt the holotype. Putzey's description of the colour is based on an immature specimen but the expression

"légèrement bronzé" is difficult to understand. A slide of the genitalia, though not perfect on account of the immature condition, showed the penis form of *cathaicus*.

Shining, black or dark piceous, prothorax sometimes brown, side-margins of prothorax, apical part of suture and of side-margins of elytra paler; mouth-parts, antennae and legs yellowish-red. Head broad with large, prominent eyes. Prothorax (fig. 23C) very convex, the sides slightly sinuate before the denticulate hind angles, base (except in the middle) and sides with raised margin; basal foveae large and deep but with diffuse external limit,

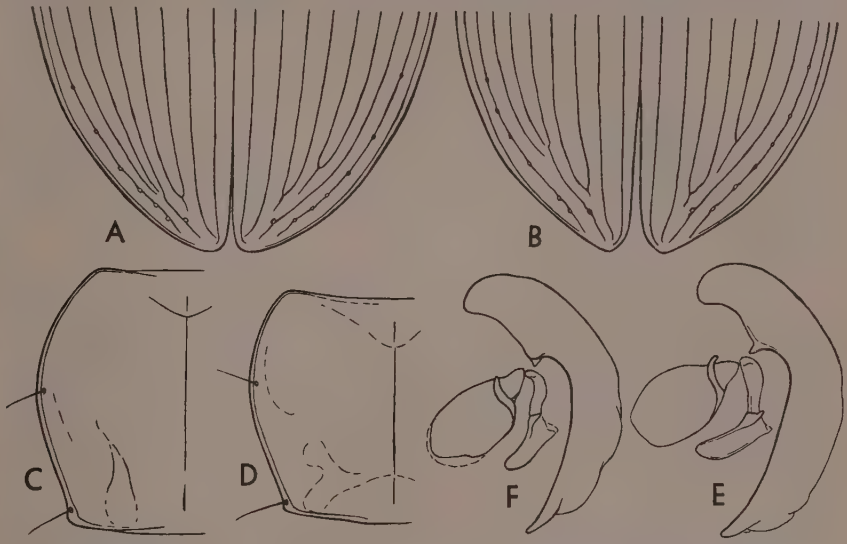

FIG. 23.—A–B, apex of elytra; C–D, prothorax; E–F, aedeagus. A, C, E, *Synuchus cathaicus* Bts. (China, Fukien); B, D, F, *S. tokararum* sp. n., paratypes (Japan, Tokara Islands).

basal margin almost straight, only very slightly arcuate inside the angles. Elytra parallel-sided (especially in the male) with deep, smooth striae and the median intervals clearly convex; basal margin varies considerably, from almost straight to evidently arcuate, but shoulders always only slightly prominent, broadly rounded, though in some individuals with the suggestion of a very obtuse angle; apex, fig. 23A. Microsculpture meshes of elytra only partly isodiametric, largely fusing to very transverse meshes. Hind tarsi furrowed on both sides. Wings fully developed and strong. Aedeagus, fig. 23E. *Length*: 11·5–13·2 mm.

Distribution.—CHINA: Prov. Fukien, Foochow (*loc. class.*) (BMNH; coll. Bates, MNP, UMB), 15.iv.35, Minkiang, 16–18.iv.35, several (4 teneral), Manoi, 17.iv.35, 4 ex., Kushan 8.iv. (teneral), 3.v.35, 2 ex. (*E. Suenson*). Prov. Szetshuan, Tatsienlu (BMNH; coll. Jedlička), Mt. Yunling (coll. Jedlička).

51. **Synuchus tokararum** sp. n.

Closely related to *cathaicus*. Shorter and broader throughout, the upper surface dull, the legs more yellowish. Prothorax (fig. 23D) broader with greatest width before middle.

Elytra less convex with flatter intervals, the extreme apex diverging from the suture (fig. 23B); microsculpture consisting of strong, regularly isodiametric meshes throughout. Second and third protarsal segments more dilated in the male, with more rounded sides. Hind wings fully developed and strong. Penis (fig. 23F) with slenderer, slightly more reflexed, apex. *Length :* 11·1–12·0 mm.

Distribution.—Japan : Tokara Islands (29–30° N.) (*S. Uéno*) : Takarajima island, Ohike, 29–30.v.53, ♂ holotype, ♀ allotype, 5 paratypes, north coast, 26.v.53, ♀ paratype ; Nakanoshima island, Satomura, 25.v.53, ♂ paratype. Mr. Uéno informs me that the seven first-named specimens were taken on the border of a small lake (Ohike) flooded after heavy rain.

52. *Synuchus pseudomorphus* Semenov.

Calathus pseudomorphus Semenov, 1889*a* : 362–363.

I have not seen this species but the original description and especially supplementary notes (*in litteris*), including a habitus drawing, from Mr. Jedlička (based on a " type " in his collection) confirm its taxonomic position near to *cathaicus*.

From that species it seems to differ in the following points :

Smaller and slenderer. Base of prothorax obliquely truncate inside the hind angles, which are less prominent (though in this respect variable, according to Semenov). Intervals of elytra flat and their microsculpture regularly isodiametric, as in *tokararum*. From this species it is distinguished by the much slenderer body, the oblique base of prothorax, and the non-divergent tips of elytra. Hind-tarsi smooth inside. Status of hind wings unknown. *Length :* 9–11·5 mm. (according to Semenov).

Distribution.—China : Prov. Kansu, v.85 (*Semenov, l.c.*, the type is probably in the Leningrad Museum).

The *callitheres* group (*Paradolichus* auct., p.p., *nec* Semenov)

Prothorax (figs. 24A, B) narrow with well defined hind angles and the sides sinuate or straight in front. Meso- and meta-tarsi, in the female also the pro-tarsi, furrowed on both sides. Microsculpture of elytra consists in the male of irregularly isodiametric or slightly transverse meshes with a tendency to form transverse rows ; in the female it is much stronger (elytra dull), absolutely isodiametric, without any transverse arrangement.

53. *Synuchus callitheres* Bates.

Dolichus callitheres Bates, 1873*a* : 272–273.

The single female holotype is in the BMNH.

This is the most variable of all *Synuchus*. Originally I felt inclined to suppose two or even three species within the group but more material revealed the occurrence of all kinds of intergrades. The variation affects the size and, above all, the form of the prothorax ; also the penis shows an unusual degree of variation. The population of Kamikôchi (pref. Nagano ; 82 ex. seen) especially differs in the small and slender body and the more convex prothorax.

Piceous black, margins of prothorax and of elytra (including the suture at tip) brown, mouth-parts, antennae and legs yellowish-red. Prothorax (figs. 24A, B) with deep but ill-defined basal foveae which are more or less prolonged forwards ; sides usually straight but sometimes clearly sinuate before the hind angles ; these may protrude as a denticle outside the basal setigerous puncture but are usually more or less rounded ; in some indi-

viduals the basal foveae contain an oblique, ridge-like tubercle. Humeral angle of elytra sometimes protruding and forming almost a right-angle, but as a rule more or less rounded ; side-margins with faintest suggestion of a subapical sinuation ; striae moderately deep, intervals slightly convex. Hind wings fully developed. Penis (fig. 24C) with two angulate processes dorsally near the apex which, however, vary a good deal in prominence. *Length :* 9·8–14·0 mm.

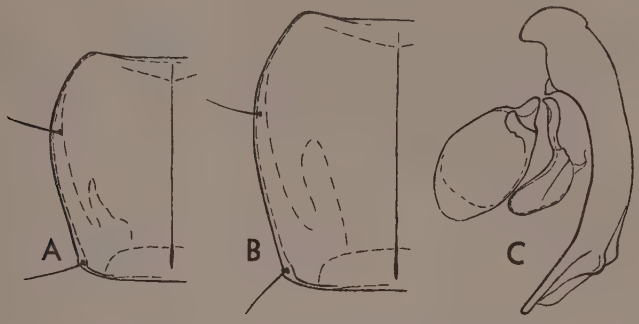

Fig. 24.—*Synuchus callitheres* Bts. A, prothorax (Japan, Nagano, Kamikôchi) ; B, ditto (Japan, Kyoto) ; C, aedeagus (Japan, Nagano).

Distribution.—Japan : Kyushu. Pref. Oita, Beppu and Oita, 6–15.x.35, 3 ♀ (*E. Suenson*). Honshu, Pref. Hyogo (*loc. class.*). Pref. Osaka, Yodogawa, Kuzuha, 13.v.47, ♀ (teneral) ; Moriguchi, 20.vi.49 ♀ (*S. Uéno*). Kyoto district, x.45, several (*Darlington*, MCZ). Tokyo district, Tamagawa, 19.x.07, ♀ (MNP). Pref. Nagano, Kamikôchi, 9–11.ix.35, 3 ex., 24.vi. (teneral), 4–5.vii. (2 teneral), 13–27.vii. numerous (some of them slightly teneral) 1939 (*E. Suenson*), 1550 m., 29.vii.53, 3 ex. (*S. Uéno*). Pref. Aomori, Kuzugawa, Takedate-mura, 7–14.vii.48, 7 ex. (1 teneral) (*K. Shimoyama*, coll. Uéno).

The *atricolor* group.

Prothorax very narrow (longer than greatest width), basal foveae prolonged to the middle of the disc, all angles rounded ; lateral raised margin very diffuse, the anterior setigerous puncture widely removed from the side-margin. Antennae and legs long and slender. Hind wings reduced to an almost inconspicuous rudiment. The entire habitus gives the impression of an *Agonum*. Japan.

54. *Synuchus atricolor* Bates.

Eucalathus atricolor Bates, 1883 : 288.

The identification was confirmed on a series of authentic specimens in the BMNH. Bates referred this species to *Eucalathus*, Jedlička (1953 : 89, 110) to *Paradolichus*, apparently on the grounds of general habitus alone. The parameres show its association with *Synuchus*.

Deep black, moderately shining, mouth-parts, antennae and legs brownish-red, the femora more or less darkened. Head broad with prominent eyes, almost as wide as prothorax over the front angles. Prothorax (fig. 25A) convex, broadest before middle, front angles little prominent, hind angles completely rounded, basal foveae shallow, ill-defined, with a prolongation forwards, running parallel to the side-margin. Elytra convex with

short, slightly arcuate basal margin, strongly obtuse humeral angle and slight preapical sinuation of side-margin; striae deep, impunctate, intervals very convex throughout. Microsculpture of elytra consists of rather coarse transverse lines, fusing to slightly transverse or more or less isodiametric meshes. Tarsi smooth (only in one female from Minoo, Osaka, have I seen a shallow longitudinal furrow on the outside of meso- and meta-tarsi). Aedeagus, fig. 25D. *Length:* 12·1–14·0 mm.

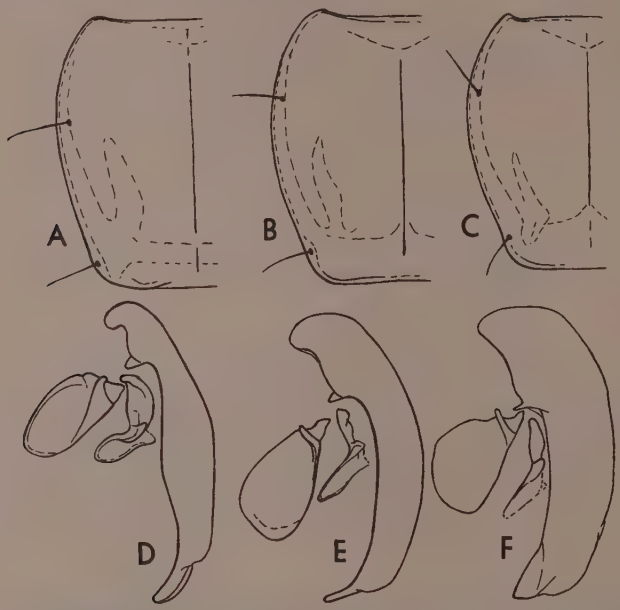

Fig. 25.—A–C, prothorax; D–F, aedeagus. A and D, *Synuchus atricolor* Bts. (Japan: A, Osaka; D, Nara); B and E, *S. picicolor* sp. n., allotype (B) and paratype (E) (Japan, Mie); C and F, *S. iricolor* sp. n., holotype (immature) (Japan, Kôchi).

Distribution.—Japan: Honshu. Pref. Osaka, Minoo, 20.viii.46; Nose-Hattani, 18.vi.49, 5 ex. (1 slightly teneral); Todoromi 26.vi.49; Takayama, Kiyotani-mura, 7.vii.46 (*S. Uéno*). Pref. Nara (BMNH); Mt. Kongô, 21.xi.48 (*S. Uéno*). Pref. Tochigi, Nikko and Chuzenji (BMNH).

55. **Synuchus picicolor** sp. n.

More depressed than *atricolor*, especially the elytra (side view). Colour more piceous black, the femora usually not darkened. Head much narrower, the eyes smaller and flatter. Prothorax (fig. 25B) less convex, with better defined depression along side-margin and raised basal bead laterally. Elytra faintly iridescent, due to much denser microsculpture with very transverse meshes; side-margin without preapical sinuation, the intervals less convex. Hind tarsi furrowed on both sides. Aedeagus, fig. 25E. *Length:* 10·7–13·0 mm.

Distribution.—Japan: Honshu. Pref. Wakayama, Mt. Kôyasan, 24–25.vii.42, ♂ holotype, ♀ paratype (*Y. Yano*, coll. Uéno). Pref. Mie, Akamé, 15.xi.47, ♀ allotype, ♂ paratype (*S. Uéno*).

56. **Synuchus iricolor** sp. n.

This species comes very close to *picicolor* but the distinguishing characters seem to be of specific value. Unfortunately, the single male available is immature and the genital slide is imperfect.

Slenderer than *picicolor*, the elytra especially longer. Head (including eyes) broader, though not as broad as in *iricolor*. Prothorax (fig. 25C) with more prominent front-angles, the sides more broadly reflexed, especially basally, the basal foveae less evidently prolonged. Elytra more clearly iridescent (but with the same kind of microsculpture), with completely rounded humeral angle and still less convex intervals. Hind tarsi with only a faint suggestion of an external furrow. *Length :* 11·8 mm.

I was long in doubt as to the wisdom of establishing a new species on the single male ; but the form of the penis (fig. 25F), though considerably deformed owing to the immaturity of the specimen, especially the very short apex, seems to justify the procedure.

Distribution.—Japan : Shikoku. Pref. Kochi, Mt. Kajigamori, 1200 m., 21.vii.52, ♂ holotype (*M. Iga*, coll. Uéno).

5. The Pristosiae.

(With the characters of the single genus *Pristosia* Motschulsky, 1864, syn. *Eucalathus* H. W. Bates, 1883)

The main feature characterising this large and polymorphic genus lies in the male genitalia. The whole aedeagus is " inverse ", i.e. lying in repose on its *left* side. On this character Jeannel (1937 : 74, 76, 80–81) fixed the monotypic " genus " *Laemostenopsis* Jedlička (1931*a* : 28–29) ; at the same time (p. 79), and without any explanation, he reduced *Eucalathus* Bates to a subgenus of *Calathus* Bon. The peculiar position of the penis in *Pristosia* is accompanied by a transformation of the parameres : the *left* one has become reduced, being much narrower, usually also shorter, than the right (figs. 29–31). At least one of them (though usually both) is prolonged into a soft, flat and narrow filament.[6] The conformity of these genital characters in the male is so striking within the whole genus that it must be regarded as a phylogenetic unit. Too much importance should not, however, be attached to the inversion of the aedeagus (which also occurs in *Calathus ovipennis*, p. 558) but to the structure of the parameres.

In other respects, in external characters the members of *Pristosia* display a striking polyformity, including *Calathus*-like species with an almost square prothorax, and also, species with a narrow, heart-shaped or oviform prothorax, quite similar to the normal *Agonum*- or *Colpodes*-type. From both of the last-named genera any species of *Pristosia* is at once distinguished by the *pectinate* claws. The separation from *Calathus* and allied genera may be more difficult in practice ; but, with the exception of a few Indian species of *Pristosia*, this genus differs from *Calathus* s. str. in the prosternal process being unbordered at the tip (between the front coxae). Furthermore, the pilosity of the underside of the tarsi is denser in *Pristosia* than in *Calathus* s.l.

[6] The terminal filament of the parameres is very fragile and much care must be taken not to mutilate it during dissection.

The mentum tooth is divided at the tip. The terminal segment of the palpi is simple. The prothorax, except in three Indian species, has two setigerous lateral pores. One to three dorsal setigerous pores are present on the elytra and one by the scutellum, except in some Indian species. The basal segments of the meso- and meta-tarsi vary: usually sulcate externally, sometimes (evidently in *crenata*) also on the inside, and sometimes completely smooth (e.g. *chambae*, *lacerans*). The hind wings are developed in two species only, *crenata* and *nitidula*, but only in the first-named to such a degree that they may be functional. In all the remaining species known to me the wings are completely reduced and most of them have a very limited distribution. The genus is confined to East Asia, from Lake Baical and the River Amur in the North, to E. Thibet and Kashmir in the west, and to N. Burma in the south.

The genus has hitherto passed as *Eucalathus* (Bates, 1883 : 253). This name was erected on a Japanese species, *aeneolus* Bates (1873*a* : 272), to which *colpodoides* Bates (1883 : 254) was added, while *atricolor* Bates (1883 : 288) is a *Synuchus*. The genus appeared even more heterogenous after Jacobson (1906 : 324–325), with or without expressed doubts, had included ten previously described species of "*Calathus*" from the Asian mainland, four of which (*cycloderus* Heyd. = *orbicollis* Mor., *agonus* Tsch., *pseudomorphus* Sem., and *coptopsophus* Putz. = *cathaicus* Bates) belong to *Synuchus*, whereas *fallax* Sem. is a *Calathus* s.l. Jedlička (1931*a* : 27–28; 1931*b* : 62–63; 1934 : 200–202; 1937 : 79–83; 1940 : 2–3) described a long series of new species from the East Asian mainland and Formosa, in part as *Eucalathus*, in part under the new generic names (1931*a*) of *Kanoldia* and *Laemostenopsis*. All, as far as is known, belonging to *Pristosia*, though Jedlička on this occasion made no comparison whatever between this "*Eucalathus*" and the two "new" ones. Later Andrewes (1940 : 536) confirmed the identity of *Kanoldia* with *Eucalathus* and Jedlička himself has recently (1953 : 89, 106, 110) united *Laemostenopsis* with *Eucalathus* Bates. But he still (1953 : 106) aims to maintain *Kanoldia* as a separate genus and, at the same time, transfers the main part of the earlier *Eucalathus* to *Paradolichus*, the type species of which (*przewalskii* Sem.) belongs to the Sphodri. He separates these genera on completely futile characters so that considerable confusion has now resulted.

The Indian *Pristosia*, as mentioned above (p. 489), were all treated as *Calathus* by Andrewes (1934).

The interpretation of *Pristosia picea* Motschulsky (1864 : 311–312) as identical with *Calathus pectiniger* Putzeys (1873 : 86) (*vide* p. 551) is based partly on the mutilated type of *picea*, investigated by Andrewes (1928 : 11), but mainly on the perfect agreement (except in the mentum tooth, *vide infra*) between a male of *pectiniger* in the Bates collection (MNP) and Motschulsky's description. Even should the interpretation prove to be false, Motschulsky's words "tarses . . . garnis de long poils dessous" show that he had a "*Eucalathus*" before him. Thus *Pristosia* 1864 must replace *Eucalathus* 1883. This may be regretted but, on the other hand, the name *Eucalathus* has been so maltreated, especially by Jedlička (1953), that a substitute is almost welcome.

It is not my intention at present to give a complete revision of the genus *Pristosia*, as I have been able to study only a small proportion of the numerous species described by Jedlička. I therefore restrict myself to giving short notes, where possible accompanied by drawings of the prothorax and the male genitalia,

on the species of which I have seen reliably identified specimens. The species are arranged in geographical groups.

A. Japanese Species.

(1) *P. aeneola* H. W. Bates, 1873*a* : 272 (*Pristonychus*) ; 1883 : 253 (*Eucalathus*).

The typical specimens are in the BMNH. Prothorax, fig. 27A. Aedeagus, fig. 29B. Restricted to Honshu but rather widely distributed, from pref. Hyogo (*Bates*) and Nara (*S. Uéno*) to pref. Aomori (*E. Suenson* and coll. Uéno). Some of the specimens from the extreme north are notably small and slender, resembling the following species.

(2) *P. colpodoides* H. W. Bates, 1883 : 254.

The typical specimens are in the BMNH. Normal individuals are easily distinguished from *aeneola* by the form of the prothorax (fig. 27B), but specimens almost intermediate in this respect do occur. As the brilliant green colour is by no means restricted to *colpodoides* and no consistent differences could be observed in the aedeagus (fig. 29A), I first doubted the justification of a specific separation. The microsculpture, however, seems to give sufficient distinction. In *aeneola* it is finer and denser, both on prothorax and on elytra, with less tendency to form meshes which, if evident, are very transverse. In *colpodoides* the micro-lines are stronger which gives the disc of the prothorax a duller lustre; the meshes are nowhere more than three times as wide as long, on the base of prothorax even isodiametric, though more or less irregularly so. This species seems to be restricted to central Honshu : pref. Tochigi (*loc. class.*) and Nagano (Kamikôchi ; Mt. Ontake ; Tokugôtôgé ; Mt. Nishihotaka ; 1550–2700 m.; *S. Uéno*, *E. Suenson*).

B. Formosan species.

(3) *P. viridis* Jedlička, 1940 : 3.

Characterised by the very narrow prothorax (fig. 27C). Aedeagus, fig. 29C. After a male paratype sent by the author.

Two further species, *Kanoldia miwai* and *Laemostenopsis cupreatus*, described by Jedlička (*l.c.*), no doubt also belong to *Pristosia*.

C. Species from the East Asian mainland north of (and including) Tsinlingshan (N. China).

These belong to the calathoid type, though *vigil* Tsch., with narrower and more heart-shaped prothorax, forms the transition to the agonoid type.

(4) *P. nitidula* Morawitz, 1862 : 202 ; 1863*a* : 247 (*Calathus*) ; *irideus* Mtsch., 1864 : 313 ; *punctibasis* Fairm., 1888*a* : CC (*Calathus*).

The interpretation of Morawitz' description seems clear ; furthermore I have seen two females (UMH), labelled " Terr. Ching. Shan., Nordmann jun.", one of them also " *nitidulus* Mor.", which are probably " cotypes ". Fairmaire's *punctibasis* was interpreted on a single female in MNP (Collection Générale), labelled " Coll. Léon Fairmaire 1906 " and almost certainly the type. The

species is easily distinguished from *proxima* by the characters of both species given by the author (*l.c.*), as well as by Semenov (1889*b* : 363–364), and from *elevata* sp. n. as described below. Shoulders with protruding tooth ; prothorax, fig. 26B. Hind wings fully developed in all specimens investigated but their apex, outside the stigma, is so short that the wings cannot be functional. Aedeagus, fig. 26E.

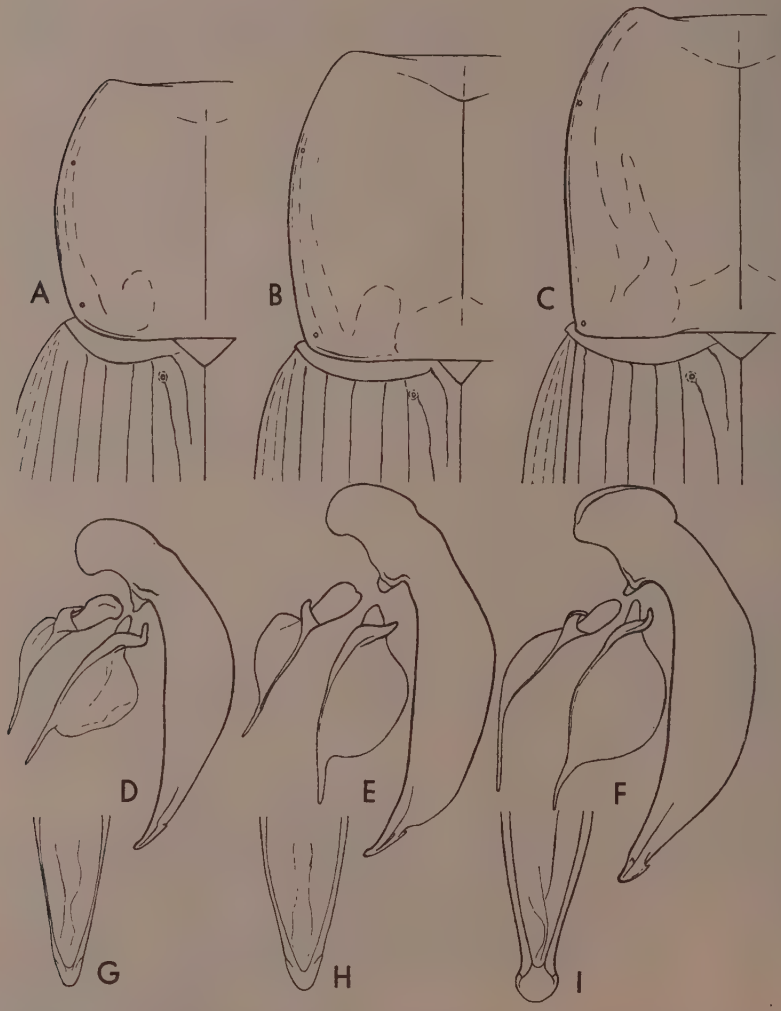

Fig. 26.—A–C, prothorax and base of elytra ; D–F, aedeagus ; G–I, apex of penis, dorsal view. A, D, G, *Pristosia proxima* Mor. (A, Nikolajevsk ; D and G, Amur ; Siberia) ; B, E, H, *P. nitidula* Mor. (B, Amur ; E, Vladivostok ; H, China, Shansi) ; C, F, I, *P. elevata* sp. n., paratypes (China, Shensi). Punctuation of prothorax omitted.

This species has a very wide distribution: I have seen specimens from Transbaicalia (Troizkosavsk, MGF), Amur region (*loc. class.*; also recorded from the island of Askold, Heyden 1884 : 274), Manchuria, E. Mongolia (Inn-shan, MGF), E. Thibet (Kuku-nor, MNW), and China, south to Ichang on the Yangtse (MNP).

(5) *P. proxima* Morawitz, 1862 : 203 ; 1863*a* : 247.

The identification is clear from the original description and from the key by Semenov (1889*b* : 363), who saw the type. Shoulders without a tooth; prothorax, fig. 26A. Aedeagus, fig. 26D. Seen from Nikolajevsk and the Vladivostok region (*loc. class.*) as well as from Korea (BMNH, MGF) and Manchuria (Gaolinzsy, DEI).

(6) *P. hweisiensis* Jedlička, 1937 : 79.

Described from Gansu (N. China) on a single female, seems to be related, but has a pronounced shoulder-tooth. Dr. Fassati, on my behalf, compared the type (coll. Jedlička) and females of *nitidula* and *elevata*. In *hweisiensis* the prothorax is narrowed towards the base (probably as in *proxima*) and the elytra are not iridescent; the microsculpture is therefore apparently coarser than in the two preceding species and *elevata*.

(7) **P. elevata** sp. n.

Most nearly related to *nitidula* but usually slightly larger, the ground colour not pure black but piceous (also in mature individuals), mouth-parts, antennae and legs reddish-brown, femora more or less darkened. Prothorax (fig. 26C) with more protruding front-angles; its sides in the basal half (though somewhat varying: in some specimens more rounded than in the fig., in others evidently sinuate) are always more parallel than in *nitidula* and the hind angles form a more or less protruding, blunt tooth; the oblique depression of the sides is broader, more pronounced and the side-margin, in side view, clearly convex; punctuation on the base and especially along the side-margin stronger and denser. Elytra longer, more parallel-sided, the shoulder-tooth stronger, more protruding; striae more densely punctured and the intervals more convex, the seventh strongly narrowed and carinate behind the shoulder. Microsculpture of elytra, as in *nitidula*, consists of extremely dense transverse lines, on the prothorax (contrary to *nitidula*) it is much coarser and fusing to evident though strongly transverse meshes. Only the elytra therefore are iridescent (the prothorax also in *nitidula*). As in *proxima*, the hind wings reduced to a diminutive size, whereas in *nitidula* they are fully developed. Penis at once distinguished (also from *proxima*) by its stout apex (figs. 26F, I) which, in dorsal view, is strongly constricted before the tip. *Length:* 13·5–15·5 mm.

Distribution.—N. China: prov. Shensi, Tsinlingshan Mts.: Hopingtse 11–1200 m., 12–16.vi. (all more or less immature), 13–14.vii.1936, ♂ holotype, ♀ allotype, 25 paratypes; Chungshantse 1500 m., 17–18.vi.1936, 20 paratypes (more or less immature) (*U. G. Dong*, coll. E. Suenson).

(8) *P. potanini* Semenov, 1889*b* : 360–361 (*Calathus*); ? *gansuensis* Jedlička, 1937 : 81.

I have seen no original material of this species, only a series of eight specimens from Kuku-nor, E. Thibet (3200 m., F. Hauser; MNW, UMB, DEI) which fit Semenov's good description (he even noticed the inverse position of the

aedeagus). The comparison made by Jedlička (*l.c.*) between *potanini* and his *gansuensis* seems only to indicate the pronounced sexual difference : the female of *potanini* is broader than the male (" *gansuensis* "), especially the prothorax (figs. 27E, F), the elytral intervals are less convex at the apex and the microsculpture stronger, its meshes a little less transverse on the disc of the prothorax. Jedlička failed to record the sex of his specimens. Aedeagus, fig. 29E. The species was described from Gansu and Szetschuan, W. China. E. Thibet, Kuku-nor.

(9) *P. vigil* Tschitschérine 1895*a* : 181–184 (*Calathus*).

No authentic material was investigated but 11 specimens from Korea, Gensan (BMNH, DEI, MGF), agree completely with the detailed original description. Prothorax, fig. 27D. Aedeagus, fig. 29D. This species seems to be restricted to Korea, from where it was described without exact information of the locality.

d. Species from South China.

These are more or less agonoid, except, as far as known to me, *falsicolor* Frm. and the taxonomically quite isolated *crenata* Putz. Two calathoid species listed above, *nitidula* Mor. and *potanini* Sem., extend into the northern part of the region. A kind of transition is formed by *szetschuanus*, *alesi*, *nitouensis*, &c. The genus is more abundant in western China than elsewhere but more material, and, if possible, field-work, are required if the problems of specific and subspecific differences are to be satisfactorily solved.

(10) *P. falsicolor* Fairmaire, 1886 : 315 (*Calathus*).

The single female type (" Ex. Mus. L. Fairm., 1896 ", coll. Oberthür, MNP) seems to be most nearly allied to *proxima* Mor. but has a brassy lustre. The shoulders are less produced (about rectangular), the prothorax has a more pronounced lateral depression in the basal half and its basal foveae are better defined laterally by a convex area. Yunnan (without exact locality).

(11) *P. alesi* Jedlička, 1937 : 82.

I have seen a male " cotype " from Szetschuan : Tatsienlu (MGF). Prothorax, fig. 27G. Aedeagus, fig. 29F.

(12) *P. nitouensis* Jedlička, 1937 : 83.

An unidentified male in the Oberthür collection (MNP) fits the description rather well and may, with some doubt, be referred to this species. It emanates from Tatsienlu, prov. Szetschuan, as did the original male. Prothorax, fig. 27H. Aedeagus, fig. 29G. The description of Fairmaire's *lateritia* (1886 : 314) fits this specimen rather well but I am not prepared to make the synonymisation without original specimens at hand.

(13) *P. szetschuana* Jedlička, 1932*a* : 73.

Eight " cotypes " seen (DEI, MGF, coll. E. Suenson). Prothorax, fig. 27I ; the dull (strongly microsculptured) lateral depressions are characteristic. Aedeagus, fig. 29H.

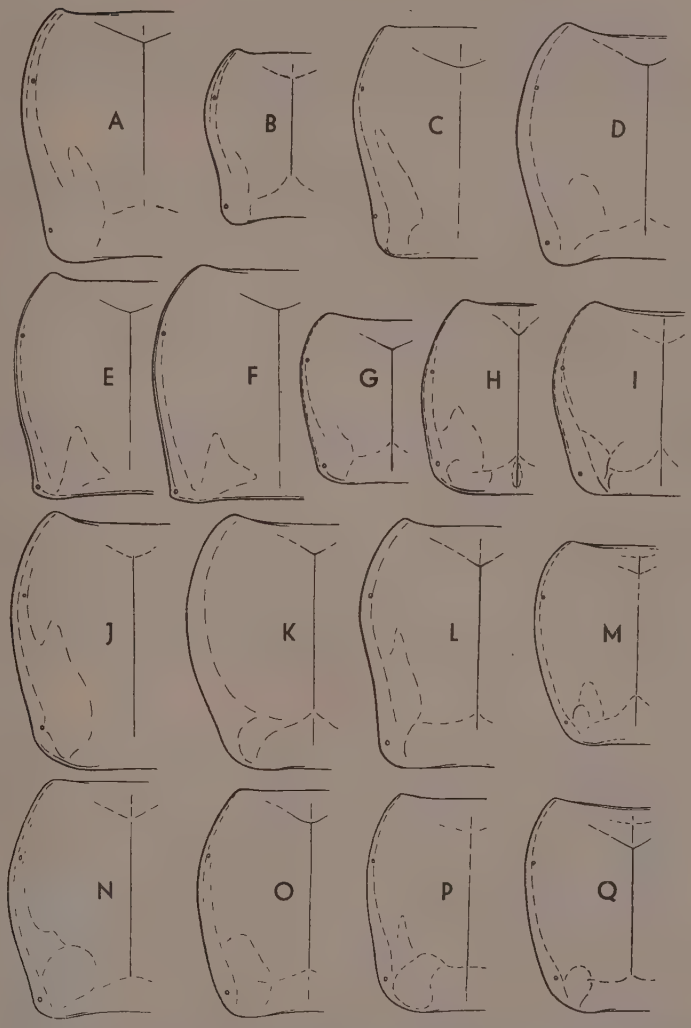

FIG. 27.—Prothorax of: A, *Pristosia aeneola* Bts. (Japan, Nara); B, *P. colpodoides* Bts., paratypes (Japan, Nikko); C, *P. viridis* Jedl., paratype (Formosa); D, *P. vigil* Tsch. (Korea); E, *P. potanini* Sem. ♂ (Thibet, Kuku-nor); F, ditto, ♀; G, *P. alesi* Jedl., paratype (China, Szetschuan); H, *P. nitouensis* Jedl. (China, Szetschuan); I, *P. szetschuana* Jedl., paratype (China, Szetschuan); J, *P. strigipennis* Frm. (China, Yunnan); K, *P. purkynei* Jedl., paratype (China, Szetschuan); L, *P. sulcipennis* Frm., " type " (China, Szetschuan); M, *P. aeneocuprea* Frm., compared with holotype (no locality); N, *P.* " *species b* " (China, " Kutsingfu "); O, *P. suensoni* sp. n., holotype (China, Chekiang); P, *P.* " *species c* " (China, Yunnan); Q, *P. delavayi* Frm. (China, Yunnan; " *komareki* " Jedl., det. author).

(14) *P. strigipennis* Fairmaire, 1888*b* : 12–13 (*Calathus*).

In the MNP (coll. Oberthür) a single female, labelled " Ex Musaeo L. Fairmaire, 1896 ", without locality but probably the type. 2 ♂ (ex coll. M. Maindron), labelled " Yunnan, 1906 ", apparently belong to the same species. Prothorax, fig. 27J. Aedeagus, fig. 29I.

(15) *P. purkynei* Jedlička, 1931*a* : 29 (*Laemostenopsis*).

This is *not* a synonym of *sulcipennis* Frm. (*vide infra*). Mr. Jedlička sent a male labelled as " type ". Prothorax, fig. 27K. Aedeagus, fig. 29J. SZETSCHUAN.

(16) *P. sulcipennis* Fairmaire, 1889 : 8 (*Pristonychus*).

Jeannel (1937 : 80–81) identified this species with the preceding, which is wrong. I investigated a ♂ (MNP), probably an authentic specimen, from Moupin, SZETSCHUAN. Prothorax, fig. 27L. Aedeagus, fig. 29K.

(17) *P. aeneocuprea* Fairmaire, 1886 : 314 (*Calathus*).

The MNP has a series of 17 specimens under this name but it is a mixture of at least two species. In the male, marked as " type ", the microsculpture of the elytra consists of transverse meshes (as it does in the male here figured : prothorax, fig. 27M, aedeagus, fig. 29L). In other specimens the microsculpture of the elytra is isodiametric. The aedeagus (fig. 29M) is very similar ; even the papillose folds of the internal sac, as seen in clove-oil slides, seem to be identical (or almost so) ; only the extreme apex of the penis is slightly different, as indicated in the figures, though I am unable to assess the stability of this character. I prefer not to describe the latter form as new until the many names given by Jedlička have been properly interpreted, but treat it here as " *species a* ". Both forms emanate from YUNNAN.

(18) *P. chinensis* Jedlička, 1933 : 86 (*Kanoldia*) ; *nec* 1937 : 83 (*Eucalathus*).

Described from prov. Kiangsi in E. China and apparently nearly related to *suensoni* sp. n. from the same region. Dr. Fassati has compared for me the single female type in coll. Jedlička with a male (MGF), labelled Kutsingfu (Harding) (probably = Kütsing, Yunnan) which, like *chinensis*, possesses a sutural tooth on the elytra. In his view they are not conspecific : the male has a narrower prothorax which is more constricted in both directions and the basal foveae are deeper ; the elytra are less coarsely punctured and the sutural tooth is much less developed. I have not ventured to describe a new species on this single male but marked it as " *species b* " only. Prothorax, fig. 27N. Aedeagus, fig. 29N.

(19) **P. suensoni** sp. n.

Piceous black, prothorax slightly iridescent, elytra with brass green lustre ; sides of prothorax reddish translucent, elytral epipleurae brown ; mouth-parts, antennae and legs reddish-yellow, femora slightly darkened. Prothorax, fig. 27O. Shoulders without tooth. Elytral striae deep with dense and evident, moderately strong punctures, the intervals convex throughout, the curvature of the basal margin varying but always evident, the tip without any trace of a sutural angle (by which it is distinguished not only from *chinensis* Jedl., 1933, but also from the " *species b* ", above). Microsculpture, on prothorax

and elytra, consists of extremely fine and dense transverse lines which show no clear tendency to form meshes. Aedeagus, fig. 29O. *Length*: 12·5–14·0 mm.

In spite of my limited knowledge of the Chinese *Pristosia* I have ventured to describe this species because it is the only one belonging to the agonoid type of this genus occurring in E. China, except *chinensis* Jedl., 1933, which is at once

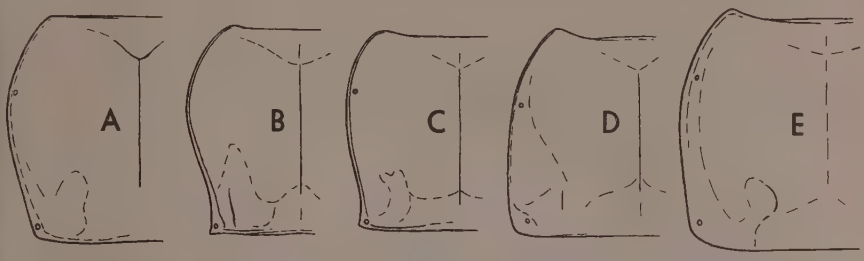

Fig. 28.—Prothorax of: A, *Pristosia picea* Mtsch. (India, Simla); B, *P. chambae* Andr., paratype (India, Chamba); C, *P. lacerans* Bts. (Kashmir); D, *P. amaroides* Putz. (India, Butan); E, *P. crenata* Putz. (Punjab, Kulu).

distinguished by its well-developed sutural tooth. The new species is very closely related to "*species b*" (above, under *chinensis*), but this has likewise a sutural tooth, though small, and there seem to be small differences in the penis.

Distribution.—China: prov. Chekiang, Tienmushan, 1050 m., 23–29.vi.1937, ♂ holotype, ♀ allotype, 3 ♂, 1 ♀ paratypes (*E. Suenson*).

(20) "*Species c*".

Two males from Yunnan were received from MGF (Coll. J. Breit) under the name of "*lateritius* Frm." but do not fit the description of this species (Fairmaire, 1886 : 314, *Calathus*; vide *nitouensis*, above). They are coloured as *suensoni* sp. n., but are at once distinguished by the narrow prothorax (fig. 27P). The aedeagus is quite different (fig. 29P). I have been unable to identify the species with any previously described (by Fairmaire and Jedlička) but do not venture to describe it on the poor basis of two incompletely labelled specimens.

(21) *P. delavayi* Fairmaire, 1887 : 96 (*Calathus*); *komareki* Jedlička, 1931*b* : 62 (*Kanoldia*).

A female of *komareki* from Sse-Tsong, Yunnan, sent by Mr. Jedlička, was compared with a series of 12 *delavayi* in the MNP and found identical. Prothorax, fig. 27Q. It is remarkable that all specimens known are females and it seems natural to assume that the silky lustre of the elytra (due to very strong microsculpture) and the flat interstices are sexual marks and that the male is more shiny. Actually, *hauseri* Jedl. (*vide infra*) seems to agree with *delavayi* in all other respects. The only objection is that, among many males of *hauseri* (MNP), I have seen one female with the microsculpture of the elytra formed as in the male. Therefore it can only be suggested that *delavayi* is the normal female of *hauseri*.

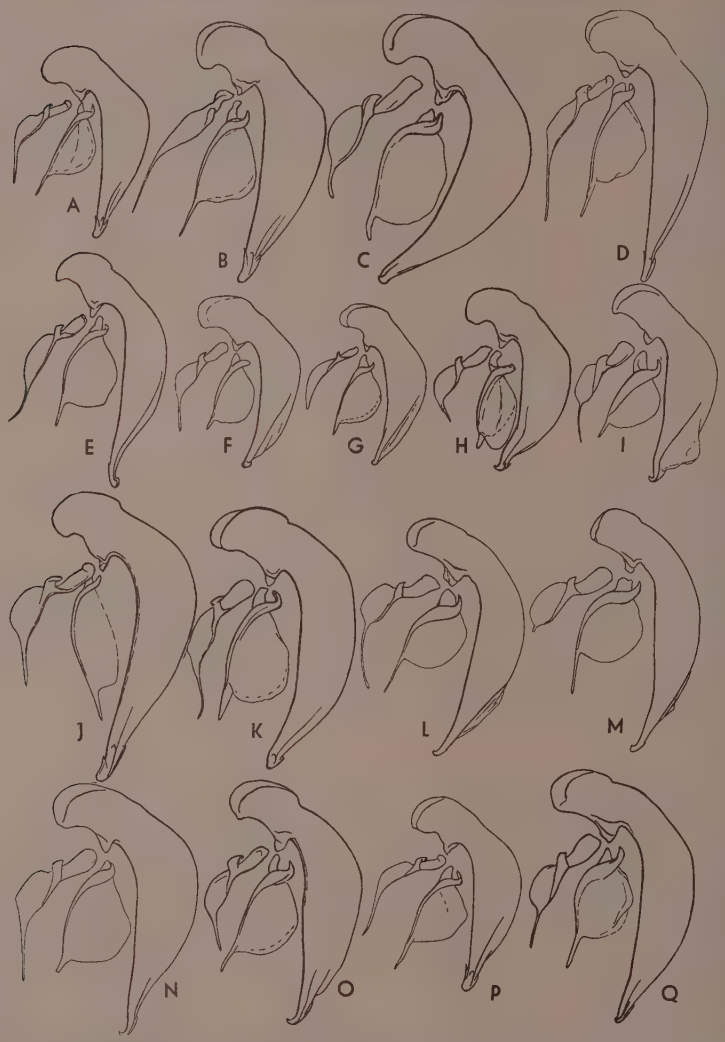

Fig. 29.—Aedeagus of: A, *Pristosia colpodoides* Bts., paratype (Japan, Nikko); B, *P. aeneola* Bts.* (Japan, Fuji); C, *P. viridis* Jedl., paratype (Formosa); D, *P. vigil* Tsch. (Korea); E, *P. potanini* Sem. (Thibet, Kuku-nor); F, *P. alesi* Jedl., paratype (China, Szetschuan); G, *P. nitouensis* Jedl.† (China, Szetschuan); H, *P. szetschuana* Jedl., paratype (China, Szetschuan); I, *P. strigipennis* Frm. (China, Yunnan); J, *P. purkynei* Jedl., paratype‡ (China, Szetschuan); K, *P. sulcipennis* Frm., "type" (China, Szetschuan); L, *P. aeneocuprea* Frm., compared with holotype (no locality); M, *P.* "*species a*"§ (China, Yunnan); N, *P.* "*species b*"‖ (China, "Kutsingfu"); O, *P. suensoni* sp. n., holotype (China, Chekiang); P, *P.* "*species c*" (China, Yunnan); Q, *P. hauseri* Jedl., det. author (China,, Yunnan).

* Filament of left paramere sometimes shorter. † Filament of left paramere possibly broken. ‡ Right paramere deformed (too narrow). § Filament of left paramere broken. ‖ Filament of right paramere broken.

(22) *P. hauseri* Jedlička, 1931*b* : 63 (*Kanoldia*).

Mr. Jedlička sent a male from Sse-Tsong, YUNNAN, which proved to be conspecific with a long series of specimens in the MNP from YUNNAN, labelled as " var. *cuprascens* Maindr." of *aeneocuprea* Frm. But this name was apparently never published and *hauseri* Jedl. remains valid. Prothorax, fig. 27Q. Aedeagus, fig. 29Q.

(23) *P. jureceki* Jedlička, 1931*a* : 27–28 (*Kanoldia*).

I have seen a male paratype (Mts. Kinfushan, SZETSCHUAN, BMNH) and a female (Giufushan, Szetschuan) from the author's collection. Aedeagus, fig. 30A.

(24) *P. tenuistriata* Fairmaire, 1889 : 8–9 (*Calathus*).

The single female type (MNP) is very reminiscent of *jureceki* Jedl., but it is narrower, especially the elytra ; the greatest width of the prothorax is at (not before) the middle and its sides are more pronouncedly reflexed. The elytral striae are finer, almost reduced to rows of fine punctures. SZETSCHUAN.

(25) *P. crenata* Putzeys, 1873 : 82 (*Calathus*).

According to the description, *Calathus yunnanensis* Jedlička (1937 : 78) is a synonym. This, as far as is known, is the only member of the genus with fully developed and certainly functional hind wings (cf. *nitidula*) and the metathoracic episterna are accordingly longer than in any other species. Prothorax, fig. 28E. Aedeagus, fig. 30D. It is more widely distributed than any other *Pristosia*. It was described from " Inde boréale ". I have seen specimens from China, prov. Fukien (Buong Kä, 26.iv.1935, 2 immature ex., *E. Suenson*) ;

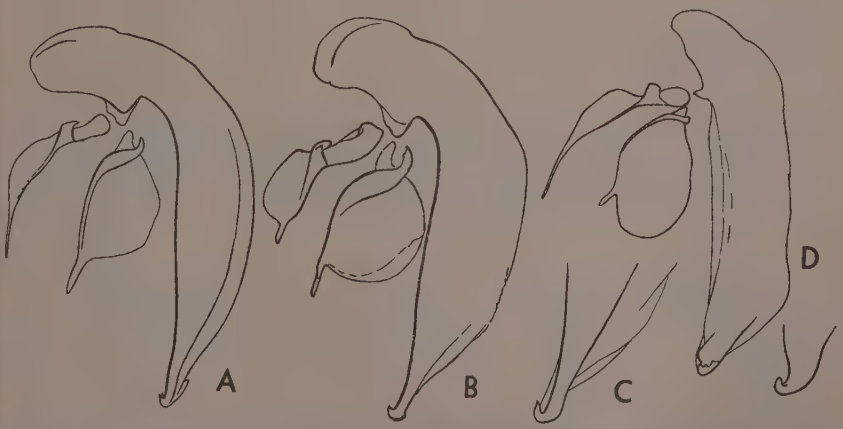

FIG. 30.—Aedeagus of : A, *Pristosia jureceki* Jedl., paratype (China, Szetschuan) ; B, *P. illustris* Andr., holotype (Burma) ; C, *P. aereipennis* Andr., paratype (immature), penis apex only (Assam) ; D, *P. crenata* Putz., combined from 1 ex., China, Fukien (penis), and 1 ex., Pundjab, Kulu (parameres and side view of apex) (both immature).

Burma (BMNH); Punjab (Kulu, MCZ). According to the proposed synonymisation with *yunnanensis* Jedl. it also occurs in W. China.

The following species from S.W. China, not seen by me, insofar as they are distinct from those mentioned above, should no doubt also be listed under *Pristosia*:

chinensis Jedlička, 1937 : 85 (*Eucalathus*). Szetschuan. The name must be changed because of *Pristosia* ("*Kanoldia*") *chinensis* Jedl., 1933 (above).

heyrovskyi Jedlička, 1934 : 201 (*Kanoldia*). Yunnan.

nubilipennis Fairmaire, 1888*b* : 13 (*Calathus*). Yunnan.

reitteri Jedlička, 1937 : 80. Szetschuan.

sienla Jedlička, 1937 : 80. Szetschuan.

yunnana Jedlička, 1931*b* : 63 (*Laemostenopsis*); 1934 : 202. Yunnan.

Whether *prentus* Jedlička, described as a *Calathus* (1937 : 79), belongs here cannot be decided. Jedlička (1953 : 110) lists, though with expressed doubts, "*piceolus* Frm." under *Eucalathus*. It seems that Fairmaire never described any species under this name; perhaps *Pristonychus picescens* (Fairmaire, 1887 : 95–96) is referred to, a species unknown to me but possibly a *Pristosia*.

e. Species from India (including Burma).

The species from this region have all (except *illustris* Andrewes) been treated by Andrewes (1934) under *Calathus* and were studied by me at the BMNH. As mentioned above (p. 489), 25 of his 34 species are true *Pristosia*, but their number should probably be reduced to 22, as three of the species described by him seem hardly distinct. Five species, all from the eastern parts (Assam, Burma), belong to the agonoid type predominant in S.W. China; the rest are more or less calathoid. One species, as indicated by its name (*amaroides* Ptz.), is habitually aberrant. Most of the Indian *Pristosia* can easily be identified by Andrewes' key. Only some short remarks, in part accompanied by drawings of the aedeagus and the prothorax, are given here. *P. crenata* Ptz. was treated above.

(a) *Agonoid type.*

(26) *P. illustris* Andrewes, 1947 : 24–25 (with a good photograph, Pl. VI, 42).

The author describes the microsculpture of the elytra as isodiametric, but in the male holotype the meshes are slightly transverse (exactly as in the female paratype of *chlorodes*), still more so in the slightly immature male paratype figured by Andrewes. Aedeagus, fig. 30B. Burma.

(27) *P. chlorodes* Andrewes, 1934 : 217.

Type ♀, paratype ♀. The shoulders and the front angles of the prothorax are more produced than in *illustris*. These two species differ from the three following in possessing two lateral punctures on the prothorax. Assam and Burma.

(28) *P. acraea* Andrewes, 1934 : 220.

Holotype ♂, paratype ♂. In the latter the aedeagus is quite mutilated and no drawing could be made. On the prothorax only the anterior lateral puncture is present. Assam.

(29) *P. quadricolor* Andrewes, 1934 : 222.

Holotype ♀. As in the following species the prothorax is devoid of lateral punctures. Assam.

(30) *P. aereipennis* Andrewes, 1934 : 222.

Both of the typical specimens are considerably mutilated but the paratype (without head and prothorax), after dissection, proved to be a male. Penis apex, fig. 30C. Assam.

(b) *Calathoid type.*

(31) *P. leurops* Andrewes, 1934 : 211.

Single ♂ type. Aedeagus, fig. 31A. Described from Kashmir. In MGF there is a series of 8 ex. from Uri and 1 ex. from Pahlgam, Kashmir.

(32) *P. braccata* Andrewes, 1934 : 211.

Holotype ♂, paratype ♀. I have seen two further males from the type locality (Pahlgam, Kashmir) in the MGF. Aedeagus, fig. 31B.

(33) *P. macra* Andrewes, 1934 : 212.

The male holotype is slightly immature. Aedeagus, fig. 31C. Kashmir.

(34) *P. aquilo* Andrewes, 1934 : 212.

Holotype ♀, paratype ♀. This species, like the three preceding, is said to have the apex of the prosternum bordered (in which they deviate from all other *Pristosia* known to me), but the paratype has clearly unbordered prosternum. Sikkim.

(35) *P. xanthopus* Andrewes, 1934 : 214.

The single male type is quite immature and no genital slide could be made, but it is a true *Pristosia* with the tarsi very hairy below. N.W. Provinces.

(36) *P. tibetana* Andrewes, 1934 : 214.

Of the single male type the author had already made a genital slide and figured the apex of the penis (*l.c.* : 221, fig. 1). The parameres, unfortunately, were completely damaged, but the tarsi are very hairy and the species belongs to *Pristosia*.

(37) *P. championi* Andrewes, 1934 : 214.

Holotype ♂, paratype ♀. Aedeagus, fig. 31D. United Provinces.

(38) *P. chambae* Andrewes, 1934 : 215.

Holotype ♂, paratype ♀. On the former there is a label : "*Pristodactyla lacerans* Bates, compared with type, H.E.A. (= Andrewes)". This can hardly be right and probably Andrewes wrote this before he prepared the full description of *lacerans* Bates (*vide infra*). Prothorax, fig. 28B. Aedeagus, fig. 31E. India : Chamba.

(39) *P. clara* Andrewes, 1924 : 101 ; 1934 : 215.

Holotype ♂, paratype ♀. In the holotype the aedeagus had been dissected but quite mutilated and no drawing could be made. Punjab : Kashmir. I very much doubt whether *edax* Andrewes (1934 : 216), holotype ♂ (aedeagus, fig. 31F), paratype ♀, is specifically distinct. It was separated from *clara* mainly

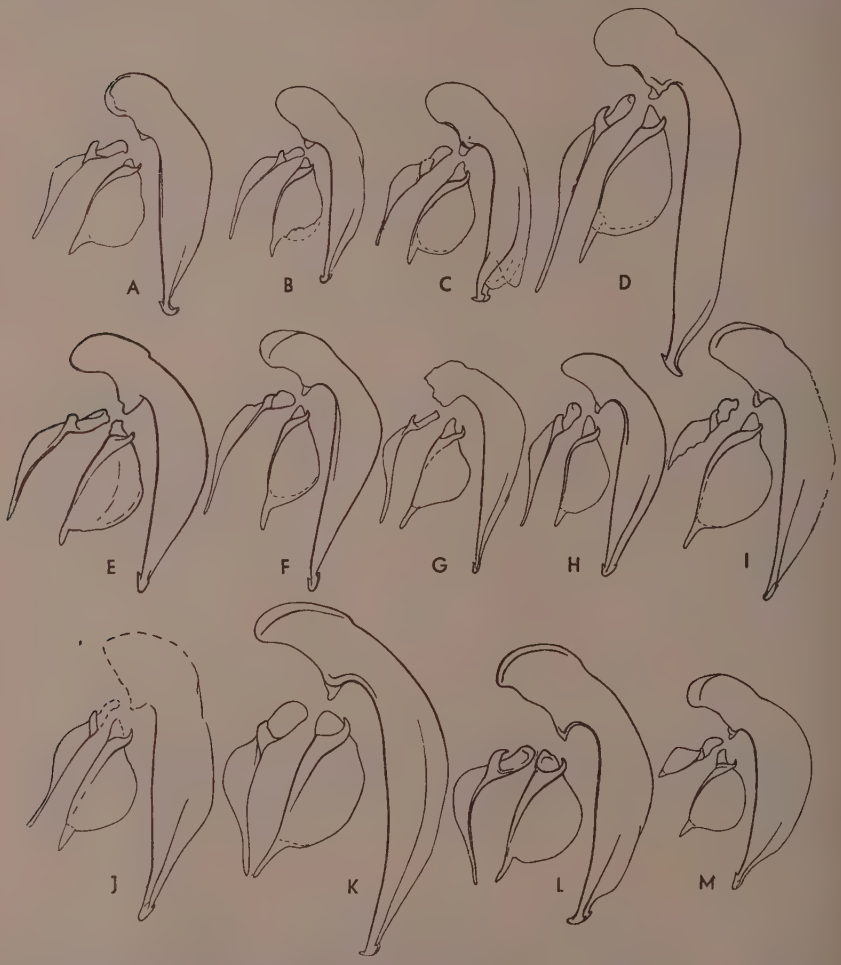

Fig. 31.—Aedeagus of : A, *Pristosia leurops* Andr., holotype (Kashmir) ; B, *P. braccata* Andr., compared with holotype (Kashmir) ; C, *P. macra* Andr., holotype (Kashmir) ; D, *P. championi* Andr., holotype (India) ; E, *P. chambae* Andr., holotype (India, Chamba) ; F, *P. clara* Andr., holotype of " *edax* Andr." (India, Simla) ; G, *P. minutalis* Andr., holotype (immature) (India) ; H, *P. leptodes* Andr., paratype (India) ; I, *P. atrema* Andr., paratype (India) ; J, *P. picea* Mtsch. (India, Simla) ; K, *P. glacialis* Andr., holotype (Kashmir) ; L, *P. lacerans* Bts. (Kashmir) ; M, *P. amaroides* Putz. (India, Butan).

on relative characters in proportions of body, etc. The author himself pointed out the unusual variability of *clara* and to three specimens (Jaloori, Lahul, Punjab, ♂; Simla, 2 ♀) he has added a label: " these 3 examples do not quite conform to the type and seem to approach *C. edax* ". The male from Lahul has an aedeagus identical with that of the *edax* type. In the MGF there is a series of five specimens from Punjab (Jaloori in Lahul and Manali in Kulu) and Kashmir (Narkanda); a male from Kulu also agrees completely in aedeagus with the *edax* type.

(40) *P. minutalis* Andrewes, 1934 : 216.

Holotype ♂ (slightly immature), paratype ♀. Aedeagus, fig. 31G. " India ".

(41) *P. leptodes* Andrewes, 1934 : 216.

Holotype and paratype, both ♂. Aedeagus, fig. 31H. United Provinces.

(42) *P. atrema* Andrewes, 1926 : 77 ; 1934 : 217–218.

Several specimens, including holotype. Aedeagus, fig. 31I. United Provinces.

(43) *P. picea* Motschulsky, 1864 : 312 ; *pectinigera* Putzeys, 1873 : 86 (*Calathus*).

This synonymy, proposed by Andrewes (1928 : 11 ; 1934 : 218), is supported by a male in the Bates collection (coll. Oberthür, MNP) from Simla, labelled (probably in Bates' handwriting): " *Pristosia picea* Mts., sec. descrip." This specimen fits Motschulsky's diagnosis of his new genus *Pristosia* exactly, except that the mentum tooth (" simple " according to Motschulsky) is bifid. But it is often noted that this character was wrongly judged by the old authors with the limited optical resources available. Prothorax, fig. 28A. Aedeagus, fig. 31J.

(44) *P. glacialis* Andrewes, 1934 : 218–219.

Holotype ♂, paratype ♀. Aedeagus, fig. 31K. The form described on a single male from the same locality as *raptor* Andrewes (1934 : 219) seems to me to be conspecific. The aedeagus of the type is identical with that of *glacialis*, except that the terminal filament of the left paramere is a trifle shorter. Kashmir.

(45) *P. lacerans* H. W. Bates, 1889*a* : 214–215 (*Pristodactyla*).

Andrewes (1934 : 219) redescribed this species after the male " type " and the label on the holotype specimen of his *chambae* (above) must be due to some mistake. The type of *lacerans* was borrowed by Andrewes from the Oberthür collection (now at the MNP) but apparently when returned it was incorrectly placed in the collection; under the *lacerans* label in the appropriate Bates drawer only two females belonging to a different species are present. But Andrewes' description seems to be sufficiently clear and to allow the identification of three males, two females from Kashmir (4 marked " Pailgam ") in the MGF. Prothorax, fig. 28C. Aedeagus, fig. 31L. The form described by Andrewes (1934 : 219–220) as *rubricrus* is hardly specifically distinct (provided my interpretation of *lacerans* is correct). I can see no difference in the aedeagus studied in a paratype from Puish, Kashmir.

(46) *P. flens* Andrewes, 1934 : 220.

The single male type is completely immature and no slide of the genitalia could be made. It is a close *Pristonychus*, with the tarsi very hairy below. Locality uncertain.

(47) *P. amaroides* Putzeys, 1877 : 103 (*Calathus*).

Very characteristic in its broad prothorax (fig. 281), which gives the insect an *Amara*-like appearance. Aedeagus, fig. 313. Sikkim.

5. Notes on the Sphodri (including *Calathus* Bonelli)

This subtribe corresponds with the "Sphodrides" of Jeannel (1914, 1937). If *Platynus* is removed from his concept of 1914, and *Prosopis* (*Encoelotrus*), *Laemosthenes* and "*Pseudodichirus*" *subtilicornis* Bates from that of 1937. In 1942 (p. 847) Jeannel speaks of "Sphodrides vrais", excluding the *Calathus* group.

The main feature of the Sphodri which separates them from the rest of the Agonini is the long, narrow, "styloid" form of one of the parameres (in all species investigated, except *Calathus oregonus* Putz., the right one). The other (left) paramere (with the exception mentioned), is ovoid, as in the Synuchi and the true Agoni. This feature in the parameres is also characteristic of the genera *Amara*, *Zabrus* and *Pelor* united as subfamily Zabrinae by Jeannel, 1942 : 899) and it is interesting to speculate whether this common, and certainly peculiar, characteristic is an indication of true relationship in spite of seemingly fundamental differences in other respects, including larval characters (*vide* van Emden, 1942).

The *Calathus* group is distinguished from the true Sphodri (*Sphodrus*, *Laemosthenes*, *Prosopigenus*, *Calathodius*, etc., *vide* Jeannel, 1937) by the following combination of characters :

Eyes convex; front without pubescence or wrinkles on the dorsal surface; antennae reversed from side to side, the fourth exceptionally including the terminal half of the fourth segment; elytra with dorsal punctures on the third interstice (except in some specimens of *Calathus melanocephalus* Linn. and *mixtus* Sturm). The genus *Thermosvilus*, with the single Caucasian species *marginalis* Chd., which, according to this definition would belong in the *Calathus* group, is probably more related to the true Sphodri, as manifested in genera, habitus, and, especially in the transformation and dense pubescence of the hind-margin; the same, which is very similar to that of *Pristonychus*, &c., in which this character is not present (Jeannel, 1937, fig. 1; 1942, fig. 288). *Thermosvilus* is also distinguished by its slightly convex, but long third antennal segment "more than twice as long as the second"; aedeagus, fig. 330.

It is not my intention to make a complete revision of *Calathus* s.l. in this paper, but only to give a key to the main groups of the genus, with supplementary notes on the more aberrant among them, some of which have passed (and perhaps merit to pass) as separate genera.

Key to the groups of *Calathus* s.l.

1. Elytra without basal setiferous puncture 2
– Elytra with an umbilicate setiferous puncture on each side of the scutellary stria 5

2 Basal segments of hind-tarsi with two external furrows separated by a ridge 3
– Hind-tarsi quite smooth on both sides (or with the faintest suggestion of an external furrow on first segment) 4
3 Two dorsal punctures of elytra adjoining the third stria. Prosternum bordered at apex. Europe . (*Synuchidius* Apf.). .9. **ganglbaueri** group
– Two dorsal punctures adjoining the second stria. Prosternum unbordered at apex. E. Asia . . . . (*Procalathus* Jedl.). .5. **fallax** group
4 Elytral striae extremely fine, almost reduced to rows of rudimentary punctures, interstices absolutely flat, dorsal punctures (if present) adjoining the second stria. C. Asia (*Acalathus* Sem.). .1. **semirufescens** group
– Elytral striae normal, interstices slightly convex, dorsal punctures (at least the anterior one) adjoining the third stria. Caucasus ("*Pristodactyla*" Sem., *nec* Dej.) . . . . . 2. **caucasicus** group
5 Dorsal puncture of elytra single or lacking. Male genitalia inverse (fig. 33K). Mexico . . . . . 8. **ovipennis** group
– At least two dorsal punctures present. Genitalia normal 6
6 Prosternum unbordered at apex 7
– Prosternum bordered at apex 10
7 Eyes small and flat (their diameter equal to about half basal segment of antennae). Prothorax (fig. 32C) with well-defined lateral bead throughout, basal setigerous puncture widely removed from the side-margin. Basal and lateral margins of elytra meet at almost a right angle. Thibet . . . . (*Paradolichus* Sem.) 3. **przewalskii** group
– Eyes normal, protruding (their diameter equal to about length of basal segment of antennae). Lateral bead of prothorax diffuse basally, basal setigerous puncture almost touching the side-margin. Shoulder-angle rounded or very obtuse 8
8 Piceous, dull, the prothorax also, which has a strong microsculpture throughout, consisting of slightly transverse, in part more or less isodiametric meshes 9
– Pure black. Prothorax shiny, its microsculpture consisting of clearly transverse meshes and less evident on the disc. Wings rudimentary. E. Asia. . . . (*Morphodactyla* Sem.) 4. **potanini** group
9 Basal segments of hind-tarsi furrowed on both sides (though less evidently internally). Elytra with very strong isodiametric microsculpture. Wings fully developed. N. America. . . 6. **advena** group
– Basal segments of hind-tarsi with very faint external furrow, smooth internally. Microsculpture of elytra consisting of slightly transverse meshes (twice as broad as long, on an average). Wings quite reduced. India . . . . . 7. **suffuscus** group
10 Mentum tooth simple, though sometimes with truncate or even slightly emarginate tip. Dorsal punctures two, adjoining the second stria. Hind wings fully developed 11
– Mentum tooth clearly bifid at apex. Dorsal punctures varying in number but usually one or more adjoining the third stria. Wings often reduced 12
11 Prothorax almost rectangular, much wider at base than at apex, sides almost parallel in the basal half, hind angles rectangular but rounded at tip. Elytra slightly shiny (less in female). The three dilated segments of the male pro-tarsi triangular. Mediterranean region. . . . . (*Bedelinus* Rag.) **circumseptus** group

— Sides of prothorax converging or sinuate towards the base which is narrower than the apex; hind-angles completely rounded. Elytra quite dull in both sexes due to granulate microsculpture. Second and third dilated segments of male pro-tarsi rectangular, parallel-sided. Southern parts of Palaearctic region. (*Dolichus* Bon.)..10. **halensis** group

12 Pro-tarsi of female with a longitudinal external furrow. Canary Islands. Madeira . . . . . **vividus** group

— Protarsi smooth in both sexes 13

13 Pro-tarsi not dilated in the male. W. Europe. Mediterranean region . . . . . (*Amphigynus* Hal.) **piceus** group

— The three basal segments of pro-tarsi dilated in the male...Holarctic region. . . . . (*Calathus* s. str.) 11. **melanocephalus** group

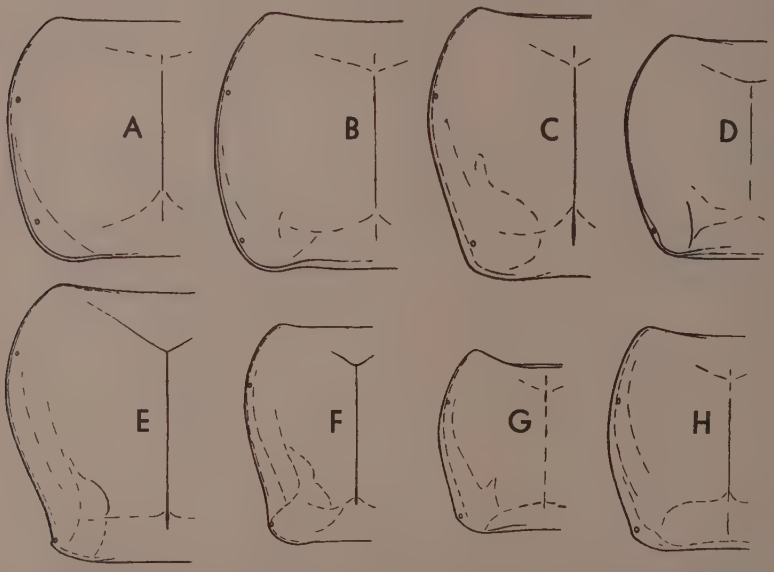

FIG. 32.—Prothorax of: A, *Calathus semirufescens* Sem., paratype (Thibet, Amdo); B, *C. validulus* Tsch. (China, Szetschuan); C, *C. przewalskii* Sem., paratype (Thibet, Amdo); D, *C. fallax* Sem., paratype (China, Gansu); E, *C. potanini* Sem. (China, Szetschuan); F, *C. coreicus* Jedl. (Korea); G, *C. suffuscus* Andr., holotype (Kashmir); H, *C. ovipennis* Putz. (Mexico).

The species from Ethiopia (Abyssinia) are unknown to me (*vide* Basilewsky, 1953 : 283–287). They seem to differ from all other *Calathus* s.l. in having a more or less developed pubescence on the apical half of the third antennal segment, though (according to Basilewsky, *in litt.*) in some species it is " presque nulle ".

REMARKS ON SOME OF THE GROUPS OF *CALATHUS S.L.*

1. *semirufescens* group (*Acalathus* Semenov, 1889*a*).

This is the most peculiar group of the genus *Calathus* and would, perhaps, merit retention as a separate genus. On the other hand it shows clear affinities

with the *caucasicus*-group. From *Calathus* s. str. the present group is distinguished by the stout, pterostichoid body, the unbordered apex of the prosternum, smooth tarsi, the absence of the scutellar puncture of the elytra, and their extremely fine striae. The dorsal punctures are more or less irregular, even lacking in some individuals ; if present they adjoin the second stria. The mentum tooth is strongly bifid. The hind wings are reduced to a very small rudiment. The three basal segments of the pro-tarsi are very dilated in the male, wider than long. The right paramere is unhooked at the tip.

(1) *C. semirufescens* Semenov, 1889*a* : 365.

I have seen 2 ♂, 4 ♀, all marked " Typus ", from *loc. class.*, Amdo in E. Thibet (Przewalski, 1884, MNW). Prothorax, fig. 32A. Aedeagus, fig. 33A.

(2) *C. validulus* Tschitschérine, 1895*b* : 501–503.

Described on a female from Amdo. Closely related to the preceding but probably distinct. It is stouter with broader prothorax (fig. 32B), the greatest width of which lies in the middle, the base more sharply arcuate laterally. The external furrow on the basal segment of meso- and meta-tarsi, mentioned by the author, must be an individual aberration. The penis (fig. 33B) is more arcuate apically, the right, styloid paramere shorter and broader, the left narrower. I have seen 2 ♂ (MNW), marked Prov. Szetschuen (W. China), 23.v.1893 (Potanin) and identified by Semenov, from whose collection *validulus* was described.

2. *caucasicus* group.

Since Chaudoir (1850 : 381) this group has been referred to *Pristodactyla* Dej. (e.g. by Semenov, 1889*b* : 691 ; Jedlička 1953 : 106) but the parameres demonstrate its natural position. The species belonging here, restricted to Caucasus, differ from *Calathus* s. str. in very much the same features as the preceding group, except that the elytral striae are normally developed, almost impunctate, and that the dorsal punctures, usually three in number, adjoin the third stria (with asymmetrical exceptions). The hind wings are completely reduced. The right paramere is hooked at the tip.

The three species described : *caucasicus* Chaudoir (1846 : 126–128 ; *vide* also Reitter, 1883 : 79–80), *praestans* Heyden (1885 : 189), and *horsti* Reitter (1888 : 88–89), are very closely related, as already pointed out by Reitter (1888). They can be separated on the penis (figs. 33C–E), which is slenderer in *caucasicus*, especially terminally ; the apex is notably short in *horsti*.

3. *przewalskii* group (*Paradolichus* Semenov, 1889*a*).

The single species, *przewalskii* Semenov (1889*a* : 369), is very peculiar and may perhaps be treated as a monotypic genus. I have seen only a female, marked as "Typus", from *loc. class.* (Thibet : Amdo, 1884, Przewalski ; MNW), and am therefore ignorant of the structure of the male genitalia. The reference of *callitheres* Bates to this genus was an obvious mistake (*vide* p. 534). The small eyes, which are shorter than the temples (in front of the constricted neck), suggest a subterranean habitat. The prothorax (fig. 32C) is heart-shaped,

strongly constricted basally, with completely rounded hind angles. The two dorsal punctures of the elytra adjoin the second stria. The basal segments of the hind tarsi have an evident sulcus with accompanying ridge externally but are virtually smooth inside. The mentum tooth is strongly bifid. The original description of the genae was incorrect and was amended by Semenov himself (1906 : 152).

4. *potanini* group (*Morphodactyla* Semenov, 1889*a*).

The two species belonging here are distinguished by the long legs, especially the tarsi which are the same length as (or longer than) the tibiae. The mentum tooth was described by Semenov as " haud bifidus " (1889*a*) and " integer " (1889*b*) but in *coreicus*, and at least in certain individuals of *potanini*, it is evidently truncate or even slightly emarginate at the tip. The apex of the right paramere is unhooked.

(1) *C. potanini* Semenov, 1889*a* : 367 ; *Pristodactyla alticola* H. W. Bates, 1891*c* : 71.

I have seen specimens identified as *Morphodactyla potanini*, and fitting the original description perfectly, in several museums. A paratype of Bates' " *Pristodactyla* " (BMNH) is identical. The terminal segment of the maxillary palp is broadly fusiform, as described by Bates. Prothorax, fig. 32E. Shoulders completely rounded. Semenov described the species as " alata " but the wings are rudimentary, without reflexed apex, though moderately so, about as long as two-thirds of the elytra. Aedeagus, fig. 33F. W. China : prov. Gansu and Szetschuan.

(2) *C. coreicus* Jedlička, 1937 : 79 (*Calathus*) ; in 1953 : 90, 110, correctly referred to *Morphodactyla*.

Very much narrower than *potanini*, especially the prothorax (fig. 32F) ; antennae and legs notably long and slender. The shoulders are produced and angulate but obtuse. The wings are completely rudimentary. Aedeagus, fig. 33G. Korea: Described from Ompo. I have seen a ♂ from Mt. Baji (N. Korea), 1270 m., 18.vii.1939 (*Y. Yano*, BMNH), which completely fits the description.

5. *fallax* group (*Procalathus* Jedlička, 1953 : 106, 111).

The single species, *fallax* Semenov (1889*a* : 361–362), closely resembles the North American *advena* Lec. (next group) superficially and, like this species, has the mentum tooth only slightly bifid. But the scutellar setigerous puncture is lacking, the hind tarsi are smooth inside, the shoulder-angle is evident though obtuse and the right paramere is unhooked at the tip. The lateral bead of the prothorax (fig. 32D) is sharply defined in its whole length, as also is the basal bead laterally ; the shallow basal foveae are separated from the side-margin by a pronounced convexity. Aedeagus, fig. 33H. Described from prov. Gansu, N.W. China. 1 ♀ (MNW) is labelled " type " and " Kan-ssu, 1885, G. Patanin ". I have also seen several specimens of both sexes from Kuku-nor, E. Thibet, 3200 m. (F. Hauser : MNW, UMB, DEI, MGF), some of them under the name " *Acalathus Tschitscherini* Reitt." This was never published but a male in MNW is marked " Type ".

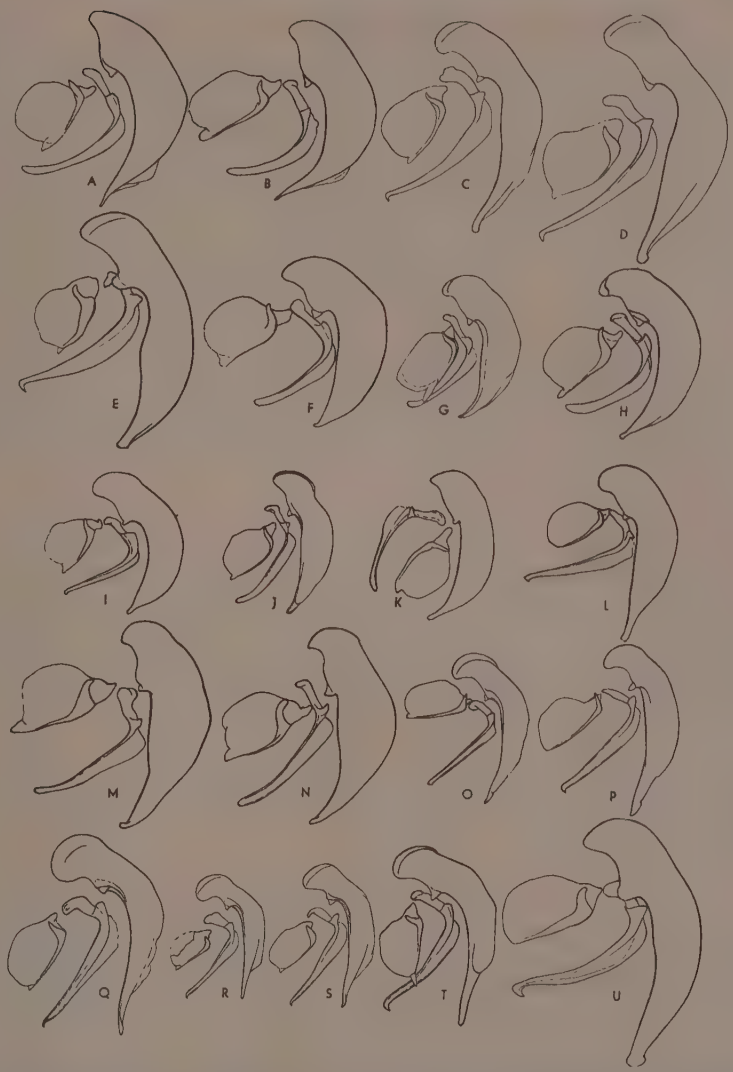

FIG. 33.—Aedeagus of: A, *Calathus semirufescens* Sem., paratype (Thibet, Amdo); B, *C. validulus* Tsch. (China, Szetschuan); C, *C. caucasicus* Chd. (Caucasus); D, *C. praestans* Heyd. (Caucasus); E, *C. horsti* Reitt. (Caucasus); F, *C. potanini* Sem. (China, Szetschuan); G, *C. coreicus* Jedl. (Korea); H, *C. fallax* Sem. (Thibet, Kuku-nor); I, *C. advena* Lec. (U.S.A., California); J, *C. suffuscus* Andr., holotype (Kashmir); K, *C. ovipennis* Putz. (Mexico); L, *C. ganglbaueri* Apf. (Jugoslavia, Korab); M, *C. halensis*, Schall. (Sweden); N, *C. davidi* Frm. (*chinensis* Sem.) (China, Szetschuan); O, *C. ambigens* Bts., paratype (Mexico); P, *C. mexicanus* Chd. (slightly immature) (Mexico, Morelos); Q, *C. himalayae* Bts. (Punjab, Kulu); R, *C. algens* Andr., paratype (Kashmir); S, *C. gelascens* Andr., holotype (Kashmir); T, *C. femoralis* Chd. (Caucasus); U, *Thermoscelis insignis* Chd. (Caucasus, Teberda).

6. *advena* group.

The single, North American, species looks like a small *Dolichus* but the prosternum is immarginate at the apex and the mentum tooth evidently though shortly bifid. The hind-tarsi are furrowed on both sides but the inside groove is shallow. The basal bead of the prothorax and the lateral bead basally are ill-defined, merely suggested. The hind wings are always fully developed. Aedeagus, fig. 33I, with slightly hooked right paramere.

C. advena Leconte, 1848 : 217–218 (*Pristodactyla*) (*mollis* Eschscholtz, 1823 : 102, *nec* Marsham, 1802 ; *brunnescens* and *breviusculus* Mannerheim, 1852 : 204 : *lenis* and *dulcis* Mannerheim, 1853 : 140–141 ; *binarius* and *scolopax* Casey, 1920 : 222–223).

I have seen types or other authentic specimens (UMH, NMW) of all the synonyms mentioned (*vide* Lindroth, 1955*a* : 114). Van Dyke (1924 : 11) is inclined to retain *lenis* and *dulcis* as subspecies of the Pacific Northwest, according to differences in habitus, but these show no geographical constancy. For description of the larva, *vide infra* (p. 561). The species is trans-American and northern in distribution, from Newfoundland to Alaska, south along the mountains to California and Colorado.

7. *suffuscus* group.

The single species differs from the other Indian *Calathus* (s. str.) by the unbordered apex of prosternum and the unarmed tip of the right paramere. The elytra possess two dorsal punctures adjoining the second stria. The mentum tooth is strongly bifid. The eyes are much flatter than in *advena* but not reduced in size.

C. suffuscus Andrewes, 1934 : 217.

Prothorax, fig. 32G. Aedeagus, fig. 33J. Kashmir, Pahlgam, single ♂ holotype (BMNH).

8. *ovipennis* group.

The single species, *ovipennis* Putzeys (1873 : 87–88) from Mexico, is taxonomically isolated. The ventricose elytra and the small prothorax give it an *Agonum*-like appearance. It was figured, though not very well, in Bates (1881–84 Pl. 4 : 20). The dorsal punctures are reduced to a single one (before middle) on each elytron or (as stated by Putzeys) they are totally lacking. The mentum tooth is bifid, the prosternum immarginate at apex ; the hind-tarsi are furrowed on both sides. The raised bead of the prothorax (fig. 32H), as in *advena*, is only suggested on the base as well as basally along the side-margin. The microsculpture on the disc of the prothorax consists of very dense and fine transverse lines ; on the elytra it is strong, forming small, irregular (in part even a little longitudinally stretched) meshes. I have seen two males : one (MNB), without locality, marked as type (but with a dorsal puncture on the elytra and therefore at least not the holotype) ; another from Huitzo, Oaxaca (Höge, coll. Bates, MNP). In both the aedeagus (fig. 33K) is inverse, in repose lying on its left side. This is therefore probably a specific character and not an

individual aberration, as is no doubt the case with "*Amara Devillai*" Jeannel (1942 : 920), separated from *aenea* DeG. on this feature. The styloid paramere (here the left one) is unarmed at the tip in *ovipennis*.

9. *ganglbaueri* group (*Synuchidius* Apfelbeck, 1908).

The almost circular prothorax with completely obsolete hind angles gives the single species a *Synuchus*-like appearance but the male genitalia (fig. 33L) indicate its true relationship. The bordered apex of the prosternum and the absence of a scutellar puncture are likewise deviations from the Synuchi. The right paramere is slightly hooked at the tip.

C. ganglbaueri Apfelbeck, 1908 : 2–3 ; 1930 : 169–171.

Described from Albania, from where I have seen a long series (including "type" and "cotypes") in MNW. It is represented there also from the Monastir (Bitolj) district in southernmost Jugoslavia.

10. *halensis* group (*Dolichus* Bonelli, 1809).

I can see no reason for maintaining *Dolichus* as a genus separate from *Calathus*. The only character of any importance seems to be the different form of the pro-tarsi in the male. These are prolonged, the second and third almost rectangular, parallel-sided. Jeannel (1942 : 850–851) gives the interesting information that in *Dolichus* (contrary to *Calathus*) the apex of the penis is bifid, "montrant la trace de deux lobes entrecroisés". This would no doubt constitute an excellent generic character, if true. But I have investigated a long series of male genital slides of *Dolichus* without finding any trace of this structure and thus find myself obliged to declare that Jeannel's statement and his drawing (*l.c.*, fig. 287B) must be based on one single mutilated specimen. The mentum tooth is simple but individually somewhat varying : sometimes clearly truncate or even slightly emarginate at apex. The hind tarsi are deeply sulcate on both sides, the furrows being delimited laterally by a pronounced ridge also on the inside. The hind wings are developed.

Dolichus has recently and independently twice been revised—by Jedlička (1936 : 31–32) and Jeannel (1937 : 79–80). According to Jedlička the genus contains six, according to Jeannel four species. One of these, *davidi* Fairmaire[7] (1889 : 7–8, *Pristonychus* ; *chinensis* Semenov 1889*a* : 368 ; *beckeri* Jedlička 1931 : 28, ♂ "type" in DEI), is clearly specifically distinct from *halensis* Schall. on account of the narrow, almost impunctate prothorax, etc., and also by its aedeagus (figs. 33M, N), the apex of the penis being shorter and less reflexed (fig. 34), and the tooth on the inside of the left paramere narrower. The hind wings of *davidi* are smaller than in *halensis*, the apex especially is shorter, and the species is probably not capable of flight. Possibly *coreicus* Jedlička (1936), which I have not seen, belongs to *davidi*. The remaining names of *Dolichus*, used by the two authors, are almost exclusively defined on colour characters and on the more or less extended punctuation of the prothorax. The

[7] The descriptions of *davidi*(*s*) Frm. and *chinensis* Sem. were both published in 1889, Fairmaire's paper in July ; the date of printing of Semenov's paper is not recorded but was probably later in the year.

brightest form, with quite red prothorax, is called *rufithorax* sp. n. by Jedlička, *halensis* vars. *ruficollis* and *eohalensis* by Jeannel; the darkest form, completely black, is *viduus* Maindron (1910 : 16). But the punctuation of the prothorax varies independently of colour ; unlike both authors above, I have seen specimens of the *rufithorax* form with the strong and extended punctuation ascribed to *viduus*. No differences in the aedeagus could be found. Even the complicated squamose folds of the internal sac (studied on clove-oil slides) proved to be

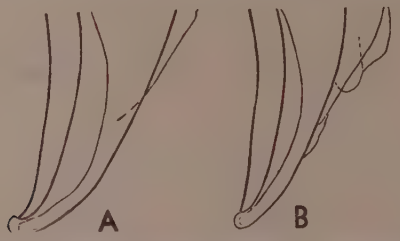

Fig. 34.—Penis apex of : A, *Calathus halensis* Schall. (" *phaeopus* Mndr." ; W. China) B, *C. davidi* Frm. (*chinensis* Sem.) (China, Szetschuan).

identical, e.g. in a male from Scania (Sweden) and one of " *viduus* var. *phaeopus*" (according to Jeannel, 1937) from Loutsekiang, W. China (R. P. Genestier, MNP), whereas in *davidi* these folds have a denser villosity and are differently arranged. Thus there seems to exist, in addition to *davidi* Frm. (and possibly *coreicus* Jedl.), only a single species of *Dolichus*, namely *halensis* Schall., which in East Asia displays a surprising amount of variability, especially in colour. The names given, most of them superfluous, may be illustrated in the form of a table.

Table I.—*Names given to colour variations of* Calathus (Dolichus) halensis *Schall.*

		Elytra.		
		Pale (with more or less dark margins).	Dark with pale central macula.	Dark.
Prothorax	Red		*pictus* Jedl. *eohalensis* Jean.	*rufithorax* Jedl. *ruficollis* Jean.
	Dark with pale border		*maculatus* Letzn. *halensis f. typ.*, Jean.	*halensis f. typ.*, Jedl. *flavicornis* F., Jean. *limbatus* Jedl.
	Dark	*brunneipennis* Jedl. *szetschuanus* Jedl. *bicolor* Mndr., Jean.	*triangularis* Jedl. *bicolor* Jedl.	*viduus* Mndr. *phaeopus* Mndr.

The names *phaeopus*, *limbatus*, and *szetschuanus* apply to dark forms with pale legs. Provisionally the dark forms of the Chinese mainland, on the average smaller in size and with stronger punctuation of the prothorax, may be united under the subspecific name *viduus* Mndr.

11. *melanocephalus*-group (*Calathus* s. str.).

This group contains the main bulk of species, for instance in Europe (Schatzmayr, 1937) all except *gangibaueri* Apf. (*Synuchidius*), *piceus* Mrsh. (*Amphigynus*), and *circumseptus* Germ. (*Bedelinus*). In America at least the following belong to *Calathus* s. str. (cf. Leng, 1920, 1927): *gregarius* Dej., *ingratus* Dej. (best treated as a subspecies of the Palaearctic *micropterus* Dft.; Lindroth, 1955*a*: 112), *ambigens* Bts. (aedeagus, fig. 33O), *mexicanus* Chd. (aedeagus, fig. 33P), *opaculus* Lec., *alutaceus* Csy., and the *ruficollis* Dej. group (Lindroth, 1955*b*), which is insufficiently known. Most of the Casey names are no doubt synonyms (Lindroth, 1954 : 137); others require further study.

It may prove expedient to extract as a separate group the species in which the basal bead of the prothorax, as well as the lateral bead basally, is absent or ill-defined. Of European species the following seem to belong here (*vide* also Schatzmayr, 1937 : 7): *solieri* Bassi, *rubripes* Dej., and *montivagus* Dej.; also the Caucasian *femoralis* Chd. (aedeagus, fig. 33T), wrongly referred by Reitter (1890 : 385, *dobretsbergeri* sp. n.) to *Thermoscelis*; and finally, three of the Indian species treated by Andrewes (1934): *himalayae* Bts. (aedeagus fig. 33Q), *algens* Andr. (aedeagus, fig. 33R), and *gelascens* Andr. (aedeagus, fig. 33S).

In *Calathus* s. str. the right paramere seems constantly to possess a hook at the tip, though it is developed to a varying degree; in *mollis* Mrsh. it may almost disappear (Lindroth, 1943 : 53).

If the groups of *Calathus* s.l. which lack a raised border at the tip of the prosternal process (groups 1–8 above) be combined as one subgenus, the names *Acalathus*, *Paradolichus*, and *Morphodactyla* (Semenov, 1889*a*) are equally valid, but I would prefer *Acalathus*.

7. Larval Characters.

Of the genera here treated as Synuchi the larva has been described of one species only, *Synuchus nivalis* Panz. (Xambeu, 1898 : 126–128). For various reasons given below, some doubt is thrown on this description, and particularly on Xambeu's account of the biology of the larva. I tried for several years to obtain eggs and larvae from isolated females of the same species but had no success until July 1954, when my friend Dr. Thure Palm sent 11 females and many males from Uppsala, Sweden. The females were isolated, each in a glass pot with soil and moss, and in the course of six weeks (from and including 5th August) produced a total of 252 larvae (only one female being sterile). The exact dates are given in Table II.

I was also able to make use of larval material of certain other species. During my visit to Newfoundland in 1951 I obtained one first stage larva from isolated females of *Synuchus* (*Pristodactyla*) *impunctatus* Say and *Calathus advena* Lec. In *Calathus* s. str., of which the larva of several species has been described (Bøving, 1910 : 334; Larsson, 1941 : 316; van Emden, 1942 : 65–66), first stage larvae of *fuscipes* Gze. and *melanocephalus* L. were at my disposal. Finally, Dr. F. van Emden kindly sent me exuviae of *ex ovo* larvae of *Platyderus ruficollis* Mrsh. The larvae of *Dolichus* (Fukuda), *Sphodrus* (Boldori, 1934,[8]) and

[8] The larva (with only one tarsal claw) ascribed to *Sphodrus* in the key by Bøving and Craighead (1931 : 22) is quite different.

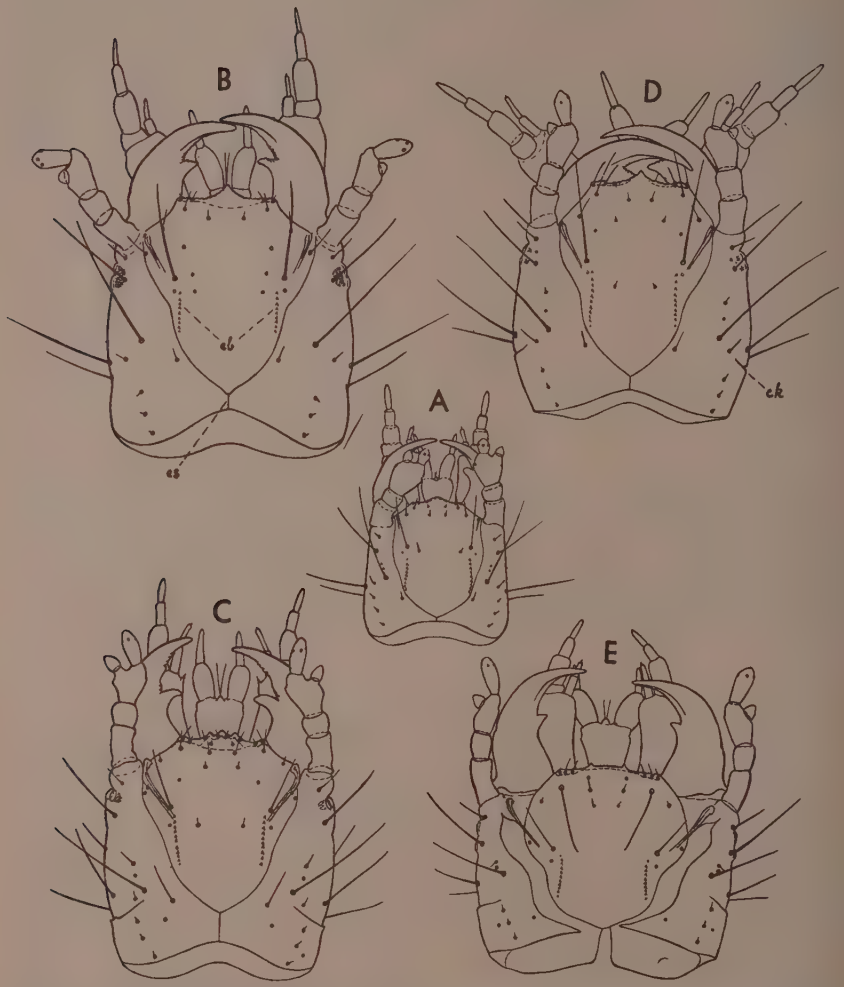

FIG. 35.—Head of first stage larva. A *Synuchus nivalis* Panz. (Sweden, Uppsala; *ex ovo*); B, *S. impunctatus* Say (N. America Miquelon; *ex ovo*); C, *Calathus melanocephalus* L. (Iceland, det. S. G. Larsson); D, *C. advena* Lec. (N. America, Miquelon; *ex ovo*); E, *Platyderus ruficollis* Mrsh. exuvium (England; *ex ovo*; van Emden). *ck* = cervical keel; *eb* = egg-burster; *es* = epicranial suture. The setae of the mouthparts are omitted. (Equal magnification.)

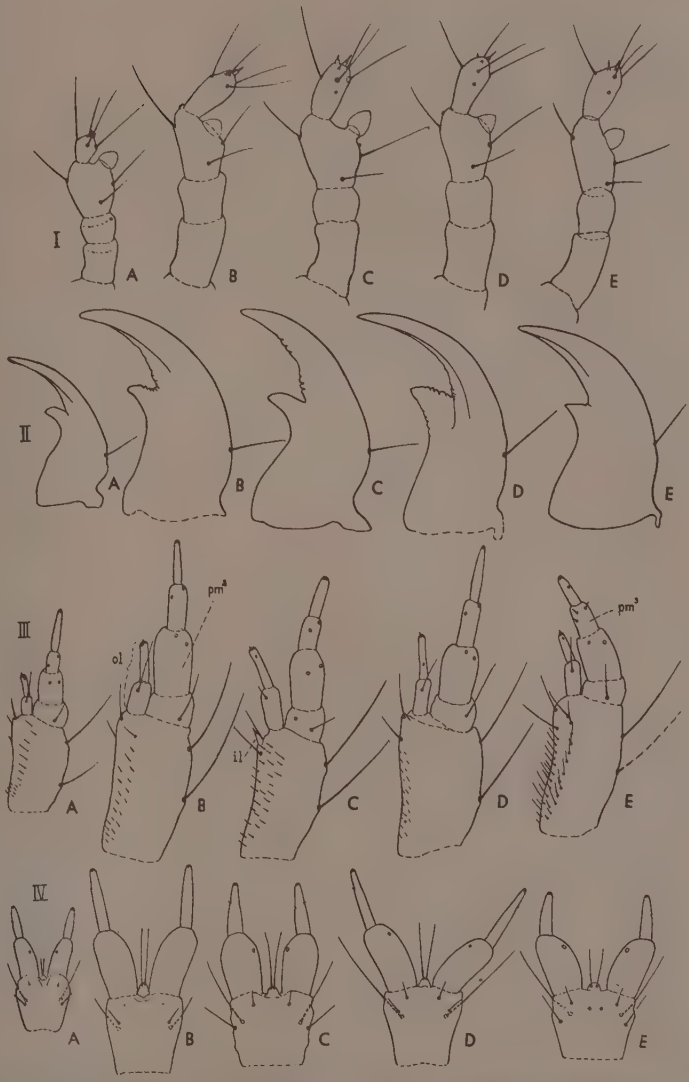

FIG. 36.—Mouthparts of the specimens in fig. 35. A, *Synuchus nivalis* Panz.; B, *S. impunctatus* Say; C, *Calathus melanocephalus* L.; D. *C. advena* Lec.; E, *Platyderus ruficollis* Mrsh. I, antenna; II, mandibula; III, maxilla; IV labium. *il* = inner lobe (lacinia), *ol* = outer lobe of maxilla; pm^2 and pm^3 = 2nd and 3rd segment of the maxillary palp. (Equal magnification.)

of several other "true" Sphodri (Boldori, *l.c.*; van Emden, 1942 : 65) are also known.

The first problem was to confirm or reject Xambeu's description (1898 : 126–128) of the presumed larva of *Synuchus nivalis*. This seems to be based entirely on the full-grown third stage larva (reported size : 9 mm.) and one of the main characteristics given, repeated by later authors (Larsson, 1941 ; van Emden, 1942), " la double rangée des points du vertex ", cannot therefore be applied to the rows of small denticles representing the eggbursters (fig. 35, *cb*). In two further respects there is an obvious difference between my first stage larva of *Synuchus nivalis* and Xambeu's description. In this (p. 126) the ocelli are said to be well-developed and pigmented, six on each side ; and (pp. 126, 128) " le bord antérieur de son premier segment thoracique marginé comme chez les larves d'Elatérides ". It is most improbable that these two features could change during the development from first to third stage larva, and particularly that the ocelli, completely absent as far as I can trace in the newly hatched larva, would suddenly appear after moulting in the mature larva. These facts indicate strongly that Xambeu described a larva of some quite different genus of Carabidae.

A detailed comparison was then made between the head capsules of the first stage larva of the following five species : *Synuchus nivalis* Ill., *S. impunctatus* Say, *Calathus advena* Lec., *C. melanocephalus* L. (Iceland, det S. G. Larsson), and *Platyderus ruficollis* Mrsh. (figs. 35, 36).

Of these, *Platyderus* seems to take the most isolated position. It has a very broad frontale which reaches the basal margin of the head (epicranial suture, *cs*, thus absent) and bears a much longer seta close to the lateral angle of the nasale. The mandibles are smooth inside with acute, triangular retinaculum. Small bristles are attached to the three pores of the third segment (pm^3) of the maxillary palp. In all these characters *Platyderus* is unique among the five species investigated (but *vide Dolichus*, below). As *Platyderus* deviates considerably from the rest of the Synuchi in imaginal characters also, its place in that subtribe may be regarded as provisional. It is not impossible to suppose that a similar reduction of the right paramere took place twice and independently among the agonoid ancestors of the true Synuchi and those of *Platyderus*.

The remaining four larvae are very similar, even agreeing in most details, and in others varying within the genus : e.g. the structure of the front margin of the nasale varies considerably between species of *Calathus* s. str. (Larsson 1941 : 316, fig. 41 *b–e*). Further, the more or less pronounced serration of the internal margin of the mandibula (including the retinaculum) seems to be a specific rather than a generic character.

It is especially remarkable that the two species of *Synuchus* show so many differences : (1) the ocelli are absent in *nivalis* but well developed and strongly pigmented in *impunctatus* ; (2) in *nivalis* the maxilla has a suggestion of lacinia (inner lobe, *il*) which is totally absent in *impunctatus* ; (3) the terminal segment of the antenna is much longer in *impunctatus* and also the penultimate segment is differently shaped ; (4) the claws are equal in *impunctatus* (as in *Calathus* and *Platyderus*) but in *nivalis* the posterior claw of each pair is considerably shorter.

The only characters found which, though not very important, seem to separate the first stage larva of both species of *Synuchus* from that of *Calathus*

(tested on *advena*, *melanocephalus* and *fuscipes*) are: (1) head more parallel-sided with greatest width at base; (2) a cervical keel (*ck*) is absent (*nivalis*) or but faintly suggested (*impunctatus*); (3) the outer lobe (*ol*) of the maxilla is shorter and does not reach the tip of the second segment of the maxillary palp (in *Calathus* exceeding it); (4) the lacinia (inner lobe, *il*) is absent (*impunctatus*) or at least less developed (*nivalis*) than in *Calathus*, where it is variable but apparently not "wanting" (Bøving, 1910 : 372; cf. van Emden 1942 : 93, fig. 47), except in *Dolichus*.

The drawing of the full-grown *Dolichus* larva published by Fukuda may be supplemented by the following observations on an exuvium (third stage) from Denmark (identified on the emerged beetle), kindly sent by Dr. S. G. Larsson. The *Dolichus* larva is separated from *Synuchus* s.l. by three of the four features characterising the remaining *Calathus* s.l. and *Platyderus*: the head has slightly rounded sides with the greatest width about in the middle; the cervical keels are well developed; the outer lobe of the maxilla exceeds the two basal segments of the maxillary palp. But the inner lobe (lacinia) of the maxilla is totally lacking. Also, in some other points, *Dolichus* deviates considerably from the *Calathus* type: the frontale is very broad, almost reaching the hind-margin of the head, the epicranial suture is thus virtually lacking (as in *Platyderus*). The nasale is broadly emarginate in front, instead of being produced medially, and its margin is completely smooth. The mandibles are likewise quite smooth internally and have a very small retinaculum; their apex is blunter. Ocelli are present. The claws are equal.

Whether the details mentioned can be used as arguments for keeping *Dolichus* generically distinct from *Calathus* (against the view held in this paper) cannot be decided, however, until a greater number of *Calathus* larvae has been studied. In all the circumstances the presence or absence of an epicranial suture seems to be a character of only limited taxonomic value: among the "true" Sphodri both types, including intergrades, are represented (Boldori, 1934 : 109–110).

The five species of which the first stage larva was carefully investigated have many features in common—the general structure of the mouthparts, the frontal rows of denticles representing the egg-bursters, etc. No doubt the three genera represented are related. But the separation of *Synuchus* s.l. from *Calathus* s.l., demonstrated by imaginal characters, particularly in the male parameres, is not clearly confirmed in the larvae. On the other hand, this does not undermine the taxonomy introduced in this paper and I hope that an investigation of a larger number of larval forms, considering also the chaetotaxy, will give clearer evidence in the future.

8. Biology.

It is a well-known fact that most *Calathus* species (in Scandinavia all except *micropterus* Dft.) are pronounced larval hibernators which emerge and appear as imagines in the first part of the summer (Lindroth, 1945 : 316–330). But some of them are more or less variable in this respect: *erratus* Sahlb. and *melanocephalus* L. show a definite tendency to change to imaginal hibernation in the more continental climate of eastern Fennoscandia (Lindroth, 1949 : 477).

In *Synuchus*, only the Palaearctic *nivalis* Panz. and the Nearctic *impunctatus* Say are sufficiently known biologically. Both seem to hibernate exclusively

in the larval stage (figs. 38, 39). Judging from the dates of capture, especially of immature beetles, mainly from East Asia, this is a feature common to the entire genus (but *vide dulcigradus* Bates, p. 515).

Xambeu reported that he found the larva of *Synuchus nivalis* in acorns associated with the larva of *Curculio* (*Balaninus*) *glandium* Mrsh., of which it first (in the fall) devoured the excrements and exuviae, later (after hibernation) the weevil larva itself. Jeannel (1942 : 841) generalised this observation : " cette espèce est parasite des *Balaninus* ". Even the most superficial knowledge

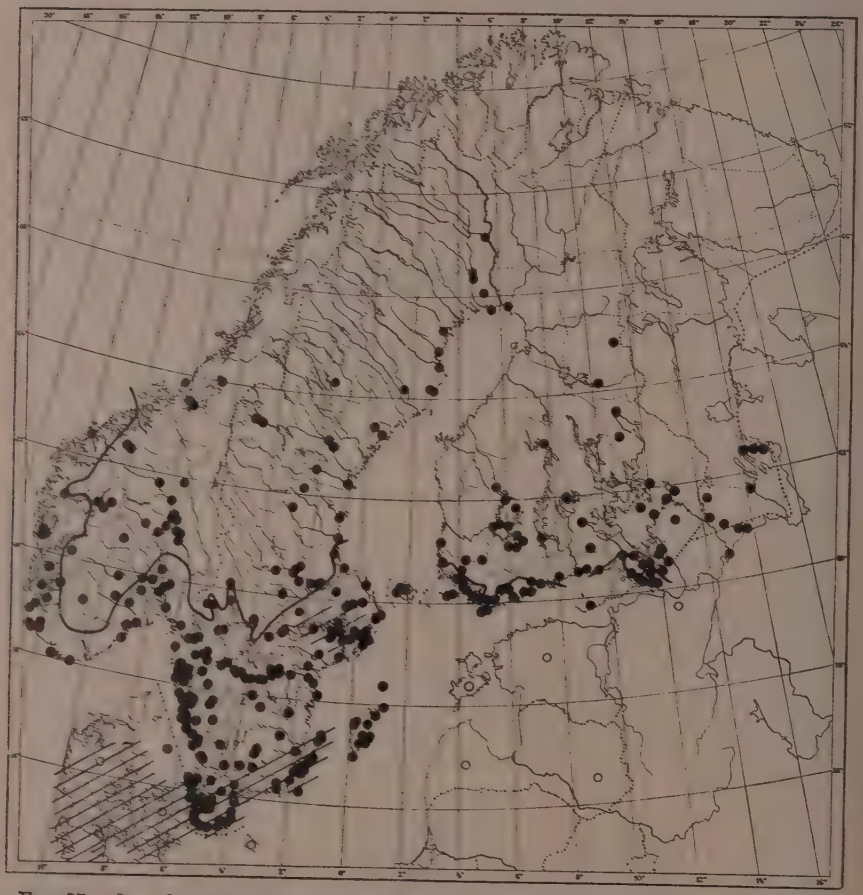

FIG. 37.—*Synuchus nivalis* Panz. Distribution in north-western Europe. Northern limit of *Quercus* indicated. Obliquely hatched area = approximate distribution of *Curculio* (*Balaninus*) *venosus* Gr. (*glandium* Desbr., nec Mrsh.).*

* This is the only Scandinavian *Curculio* developing in acorns. Only one more species, the well-known *nucum* L., is sufficiently large to serve as host of a " parasitic " *Synuchus* larva, but *nucum* is absent from the northern half of the Scandinavian *Synuchus*-area. The genus *Curculio* is not represented in Sweden north of 64° N. lat.

of the ecology and the distribution of *Synuchus nivalis* would contradict this opinion (*vide* map, fig. 37). As Xambeu was notoriously unreliable in his statements, it may be permissible to presume that what he *did* observe was one or more Carabid larvae hidden in acorns infested by larvae of *Curculio*, and perhaps even an occasional devouring of this larva. The Carabid larva may or may not have belonged to *Synuchus*. If he had actually observed the *Synuchus* female depositing her eggs in an acorn, as vividly related, it is inexplicable that he should not have described the egg, in a work which, according to the preface (1897 : 1), was especially devoted to observations and descriptions of the egg and the pupal stage.

From my own observations of the feeding habits of *Synuchus nivalis* in captivity, the full-grown beetles accepted cut pieces of living *Lumbricus* as well as bread-crumbs, showing some preference for the latter kind of food. The same foods were offered to the newly emerged larvae and, in addition, crushed specimens of *Drosophila* flies. The larvae were several times observed feeding on the flies and in three cases to behave as cannibals. After some days it could easily be observed that the gut of the semi-transparent larvae was filled with food. Curiously enough, however, it was completely impossible to induce them to moult into the second stage. The explanation in my view, probably lies in the fact that the species hibernates as first stage larva and it is consequently not due to lack of suitable food.

TABLE II.—*Reproduction in captivity of* 10 *females of* Synuchus nivalis *Panz. from Uppsala, Sweden.*

Number of female.	Date of isolation.	Possible copula.	Death of female.	Number of first stage larvae observed on : 5.viii.	6.viii.	7.viii.	9.viii.	10.viii.	12.viii.	14.viii.	16.viii.	20.viii.	23.viii.
1	16.vii	17 & 28.vii	6.ix	14	1	.	.	.	.	.	.	.	.
2	16.vii	17 & 28.vii	19.viii	5	5	1	4	.	.	3	5	4	2
3	18.vii	28.vii (observed)	25.viii	.	6	.	3	.	8	1	2	1	2
4	18.vii	28.vii	20.viii	1	10	4	.	.	.	.	.	12	4
5	18.vii	28.vii	23.viii	.	.	7	1	.	1	1	.	1	8
6	18.vii	28.vii	20.viii	.	.	.	.	.	1	1	.	4	5
7	18.vii	28.vii	23.viii	.	.	.	1	.	.	.	.	.	1
8	31.vii	.	12.viii	.	.	.	.	.	.	.	.	8	3
9	31.vii	.	23.viii	.	.	.	.	.	.	.	.	2	.
10	31.vii	.	2.ix	.	.	.	.	.	.	.	.	4	3

25.viii.	27.viii.	30.viii.	1.ix.	3.ix.	6.ix.	8.ix.	10.ix.	14.ix.	Larvae total.	Period (in days) from Last possible copula to First larva.	Last larva.	Death of ♀ to last larva.
3	8	.	.	.	6	1	.	4	37	18, 27 & 38	45	5
1	.	.	.	.	.	.	.	.	30	18 & 16	27	5
1	1	.	.	1	.	.	.	.	26	16 (& 14?)	36	8
1	.	.	.	.	.	.	.	.	32	17 & 20	27	4
3	1	4	5	4	4	3	.	.	43	17 & 20	41	15
8	5	12	2	1	1	.	.	.	40	21 (& 20?)	38	15
1	5	8	.	1	4	1	.	.	22	18 & 24	41	15
1	.	.	.	.	.	.	.	.	12*	18	24	12
1	.	.	.	.	.	.	.	.	3*	18	24	1
.	.	.	.	.	.	.	.	.	7*	18	21	.

* Females 8–10 had apparently deposited the major part of their eggs before isolation.

From Table II some information can be deduced regarding the duration of the earlier stages of development in *Synuchus nivalis* (at indoor temperature). The minimum egg-period after oviposition (last column) is 15 days (according to three observations); actually it is probably a few days longer because the female cannot be supposed to continue depositing eggs until the day of her death.

The maximum duration of pregnancy *plus* egg-period (next-to-last column) may exceed 40 days (three observations); normally it is probably several days shorter. The minimum of the same period (third last column) is more difficult to estimate because in females 1–7 it cannot be proved beyond doubt which copula is responsible for the two (or even three) groups of larvae produced by each female. In females Nos. 8–10 the figure is greater than 18 days but there the date of copula is unknown. In female No. 1 the three groups of larval data would be satisfactorily explained by assuming that the first is due to a non-controlled copula before captivity, the second and third to the controlled contact with males on 16–17th and 27–28th July respectively, which seems to be confirmed by the difference in time likewise of 11 days between the two later groups of larvae. This would mean a minimum period of pregnancy *plus* egg of 37 or 38 days, but in some of the other experiments this time is probably shorter. It is remarkable that the female seems able to receive a second male before the eggs fertilized by an earlier copula have been deposited.

9. Abbreviations.

The names of authors and collectors have been written in full. Only those of museums and institutes have been abbreviated, as follows:

BMNH = British Museum (Natural History), London.
DAO = Department of Agriculture, Ottawa.
DEI = Deutsches Entomologisches Institut, Berlin-Friedrichshagen.
MCZ = Museum of Comparative Zoology, Cambridge, Mass.
MGF = Museum Georg Frey, Tutzing, Oberbayern.
MNB = Institut Royal des Sciences Naturelles, Bruxelles.
MNP = Muséum National d'Histoire Naturelle, Paris.
MNW = Naturhistorisches Museum, Wien.
NMW = U.S. National Museum, Washington, D.C.
RMS = Swedish Riksmuseum, Stockholm.
UMB = Zoologisches Museum der Universität, Berlin.
UMH = Zoological Museum of the University, Helsingfors.
UML = Entomological Museum of the University, Lund.
UMO = Zoological Museum of the University, Oslo.
ZMC = Zoological Museum, Copenhagen.

10. Acknowledgments.

This investigation would have remained unrecorded had it not been for the unselfish co-operation of a large number of private and professional entomologists. In the first place my thanks are due to my friend Eigin Suenson, of Copenhagen, who placed his own extensive collection, made during his residence of half a lifetime in China and Japan, freely at my disposal (now in the ZMC), and to Mr. Shun-ichi Uéno, Kyoto, who did not hesitate to send all his specimens, including holotypes, from Japan. My friend Dr. P. J. Darlington, Jr., Cambridge, Mass., who has also collected in Japan, was equally generous.

Among museums officials who, without complaint, endured my almost constant queries, I am especially grateful to Mr. E. B. Britton of the British

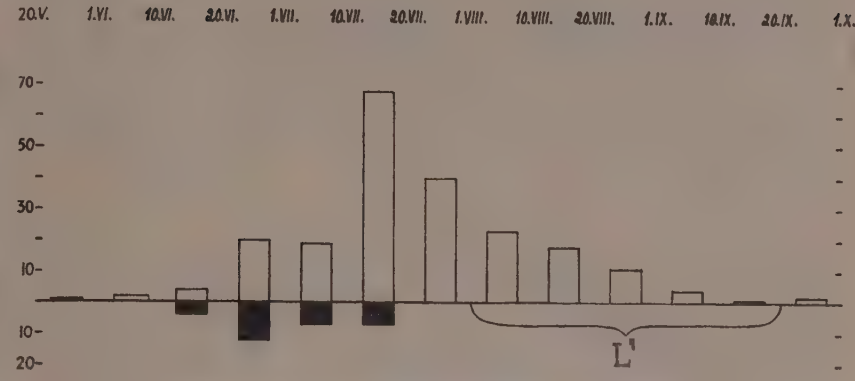

FIG. 38.—*Synuchus nivalis* Panz. Seasonal distribution in Sweden (many years) of mature (white) and immature (black) adults. L^1 = first stage larvae.

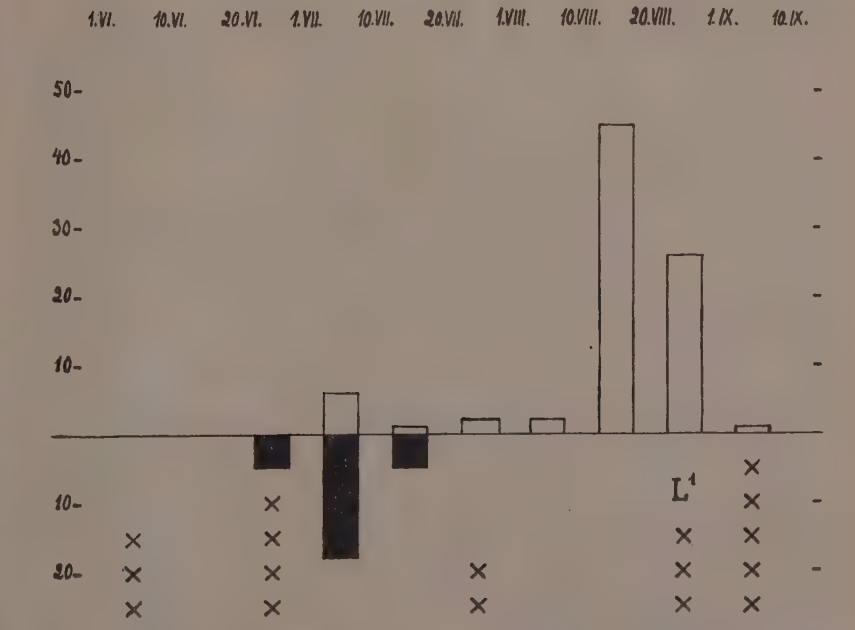

FIG. 39.—*Synuchus impunctatus* Say. Seasonal distribution in Newfoundland (in 1949 and 1951) of mature (white) and immature (black) adults. The crosses indicate observed dead beetles. L^1 = first stage larva.

Museum (Natural History). My thanks are also due to the following persons: Drs. R. Frey and W. Hackman (UMH), Dr. L. Chopard and Mr. G. Colas (MNP), Dr. O. Scheerpeltz (MNW), Dr. H. Sachtleben (DEI), Dr. K. Delkeskamp (UMB), the officials of the MGF, Dr. A. Collart (MNB), Dr. S. L. Tuxen (ZMC), Drs. O. Lundblad and R. Malaise (RMS), Drs. E. A. Chapin and R. F. Blackwelder (NMW), Mr. A. Jedlička and Dr. M. Fassati, Prague. Drs. F. van Emden, London, and S. G. Larsson, Copenhagen, provided me with valuable larval material.

11. Postscript

While this paper was in the press I received a copy of the paper by A. Habu entitled "Notes and descriptions of the *Calathus* species (Coleoptera: Carabidae) from Japan" (1955, *Bull. nat. Inst. agric. Sci. Tokyo* (C), **5**: 157–224). The author treats the Japanese species of *Synuchus* s.l. as belonging to *Calathus*. His figures of the male genitalia and, especially, his excellent habitus drawings permit the identification of most of his species as follows:

(1) *Pristodactyla crocata* Bts. has been wrongly identified by Habu (p. 172), who makes it a subspecies of *callitheres* Bts. whereas, in fact, it is identical with *shirahatai* Habu (p. 202; *vide* above).

(2) *Calathus tanzawanus* Habu (p. 180) is most probably only a small form of *Synuchus callitheres* Bts.

(3) *Calathus nipponicus* Habu (p. 185) is no doubt a synonym of *Synuchus agonus* Tsch.

(4) *Calathus brittoni* Habu (p. 188) seems to be identical with *Synuchus orbicollis* Mor.

(5) *Calathus chabo* Habu (p. 190) is the species described by me as *Synuchus picticornis*, and thus a valid name.

(6) *Calathus yasumatsui* Habu (p. 194) belongs in the *atricolor* group and is closely related to, though apparently specifically distinct from, my *Synuchus iricolor*.

(7) *Calathus silvester* Habu (p. 208) is not distinct from the rather variable *Synuchus melantho* Bts.

(8) Three species described as new, *takeuchii* (p. 192), *fukuharai* (p. 197) and *hikosanus* (p. 198), seem to be related to my *Synuchus montanus*, etc. (*vide* above) but I am unable to determine their exact position.

Habu's descriptions are careful and extremely detailed but it is almost impossible to discover the essental characters which led him to erect a new species.

In a second paper in the same issue of this journal (pp. 139–142) Habu described a new species from N.W. India under the name of *Synuchus* (*Parasynuchus* subgen. n.) *andrewesi*. The single holotype (in the BMNH) is a male but the genitalia were not investigated so that the true generic position cannot be stated. The species may equally well belong to *Pristosia* (*Eucalathus*).

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